Welcome!

Nuevos sistemas RFID para optimizar los procesos de fabricación y mantenimiento en entornos industriales adversos al uso de la tecnología de identificación por radio frecuencia

New RFID systems for manufacturing process optimization and maintenance in harsh industrial environments adverse to the use of radio frequency identification technology

HARTING

Pushing Performance

Dr. Jan Regtmeier

Product Manager RFID
HARTING Electric

Reader / Middleware / PLC Connection

- **2005 – 2007 PhD in physics**
- **2008 – 2011 group leader and project manager (Bielefeld University)**
- **since May 1st 2011 product manager @ HARTING RFID reader and accessories**

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RFID in harsh environments

Pushing Performance

HARTING

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- **Founded in 1945**
- **Headquarters in Espelkamp, Germany**
- **100 % privately owned by the Harting family**

- **Dietmar Harting,** President / General Partner
- **Margrit Harting,** Senior Vice President and Partner
- **Philip F. W. Harting,** Senior Vice President Connectivity & Networks
- **Maresa W. M. Harting-Hertz,** Senior Vice President Finance, Controlling and Tax

Figures of the Company

Business Year 2010/2011

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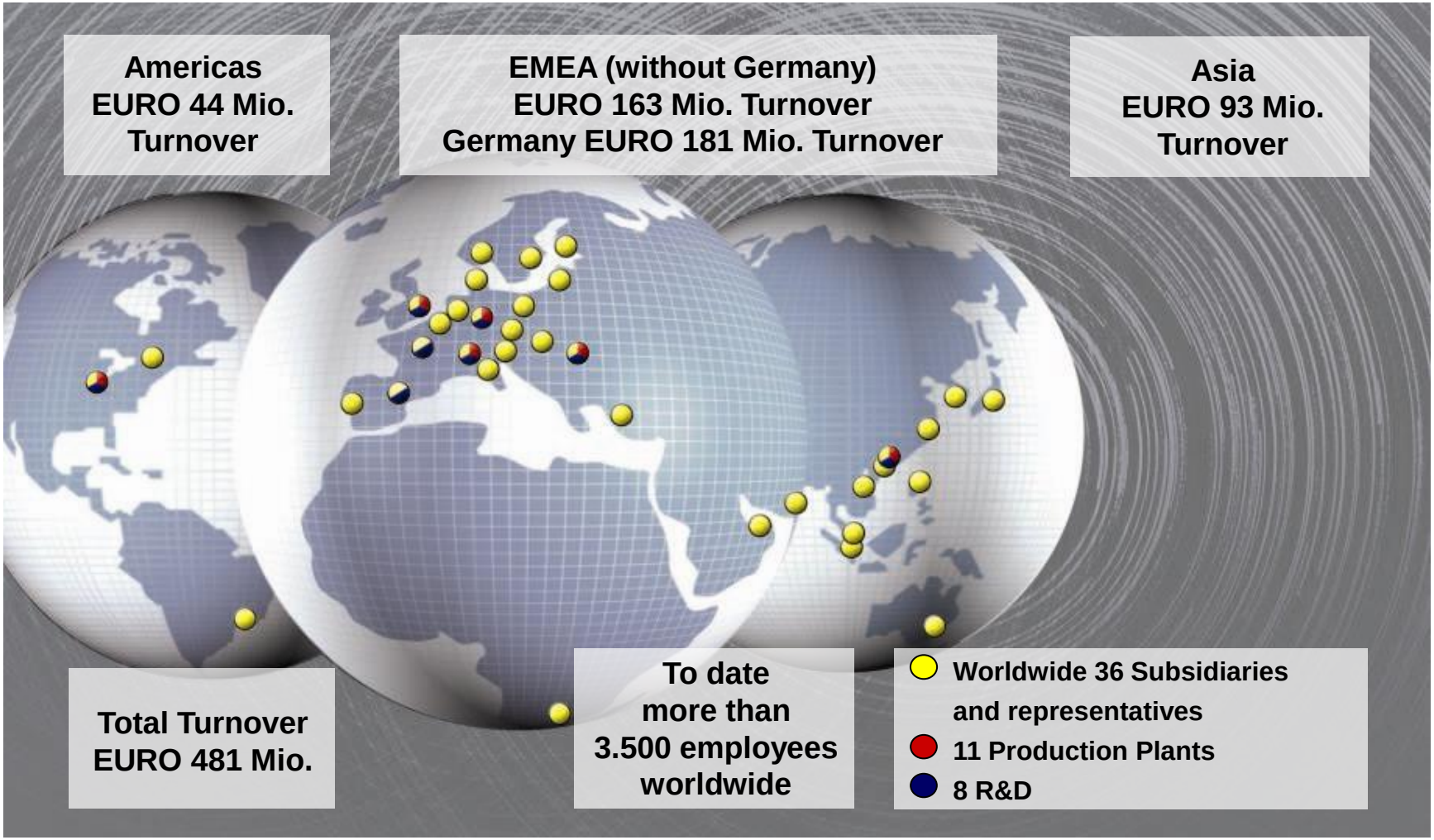

Worldwide Production Plants

Pushing Performance

Germany

Espelkamp 1

Espelkamp 2

Espelkamp 3

Espelkamp 4

Espelkamp 5

Rahden

International

GB/Northampton

CH/Biel

US/Elgin

CN/Zhuhai

RO/Sibiu

Connectivity & Networks – Triad

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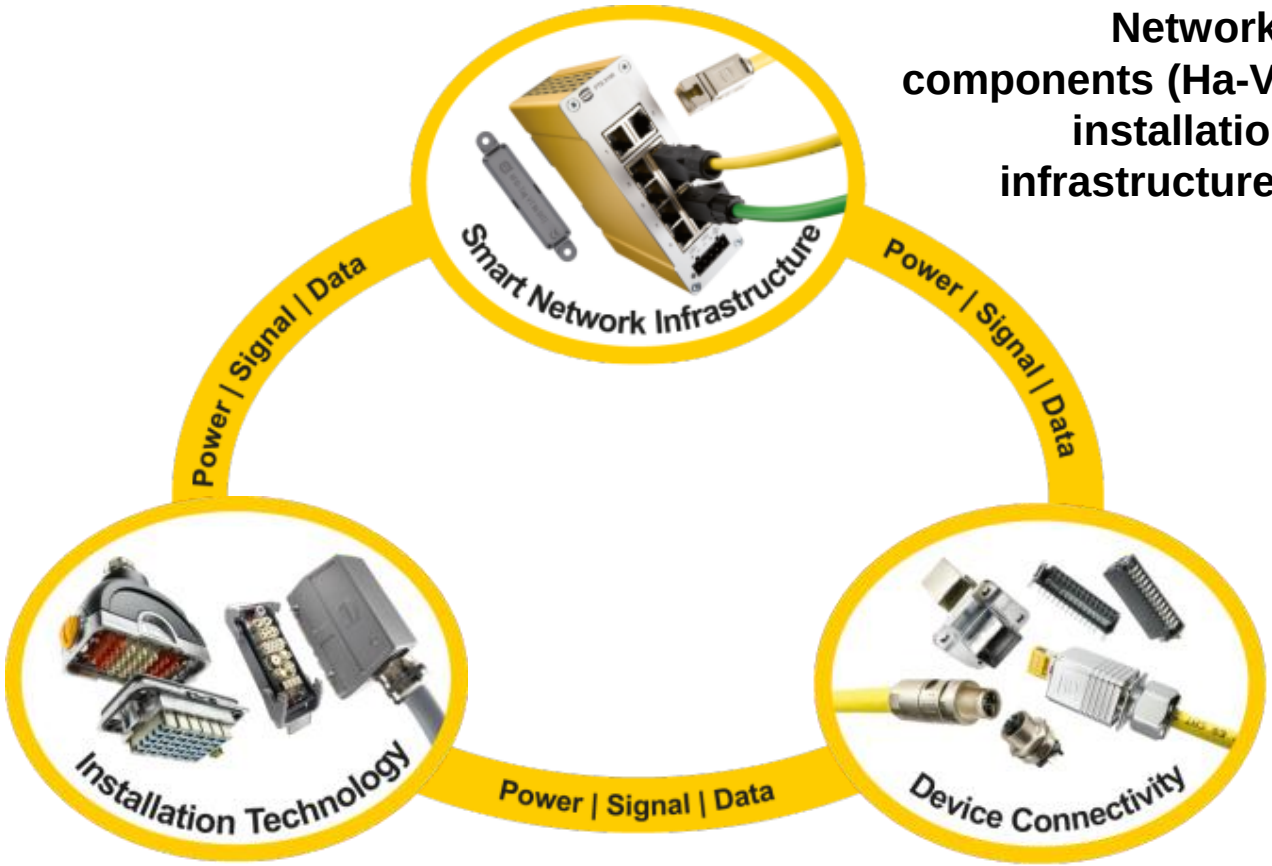


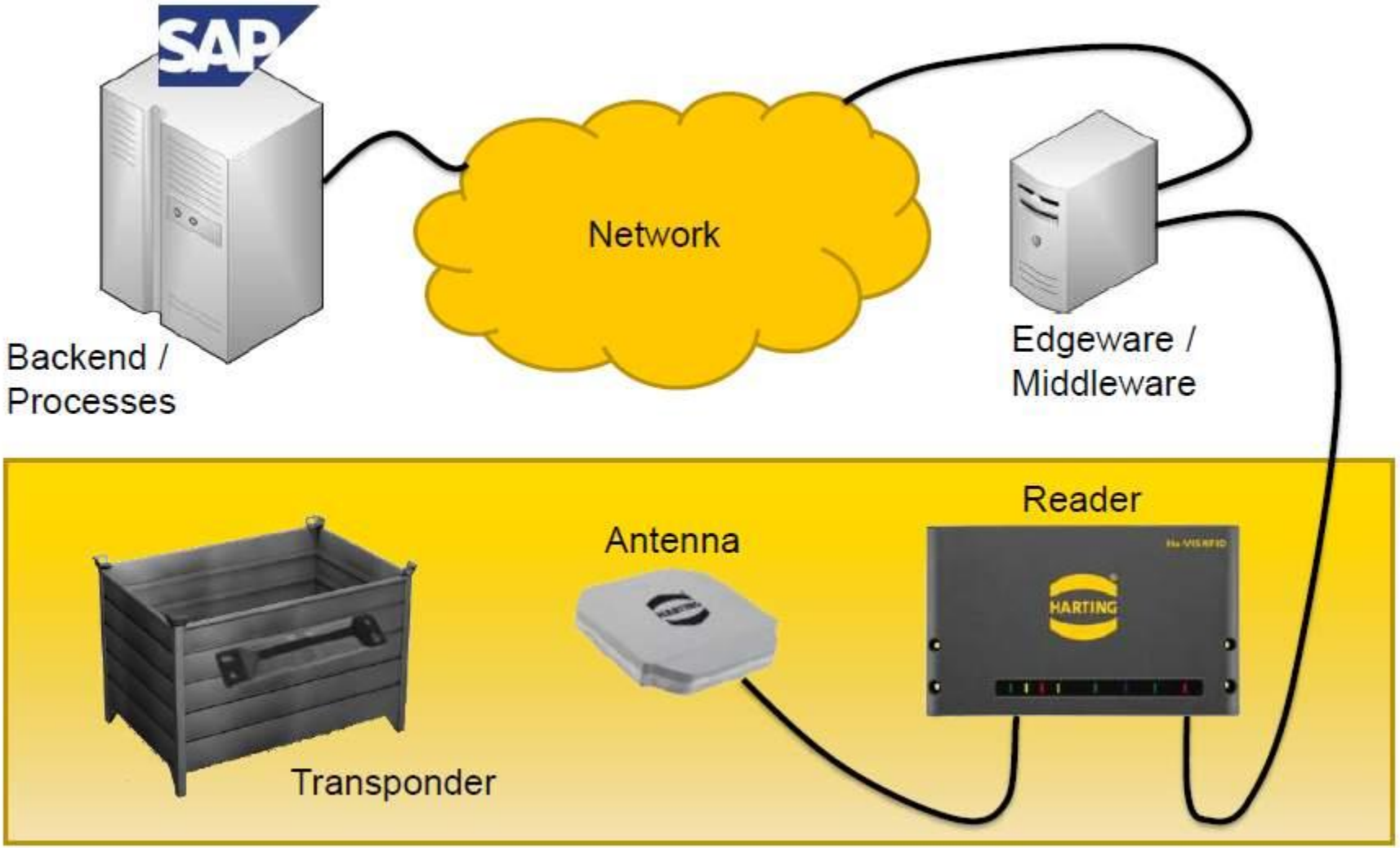
Network and RFID components (Ha-VIS) for the installation of smart infrastructure solutions (ICPN)

Industrial Connectors and Installation Solutions (Han®) for Industrial Infrastructure

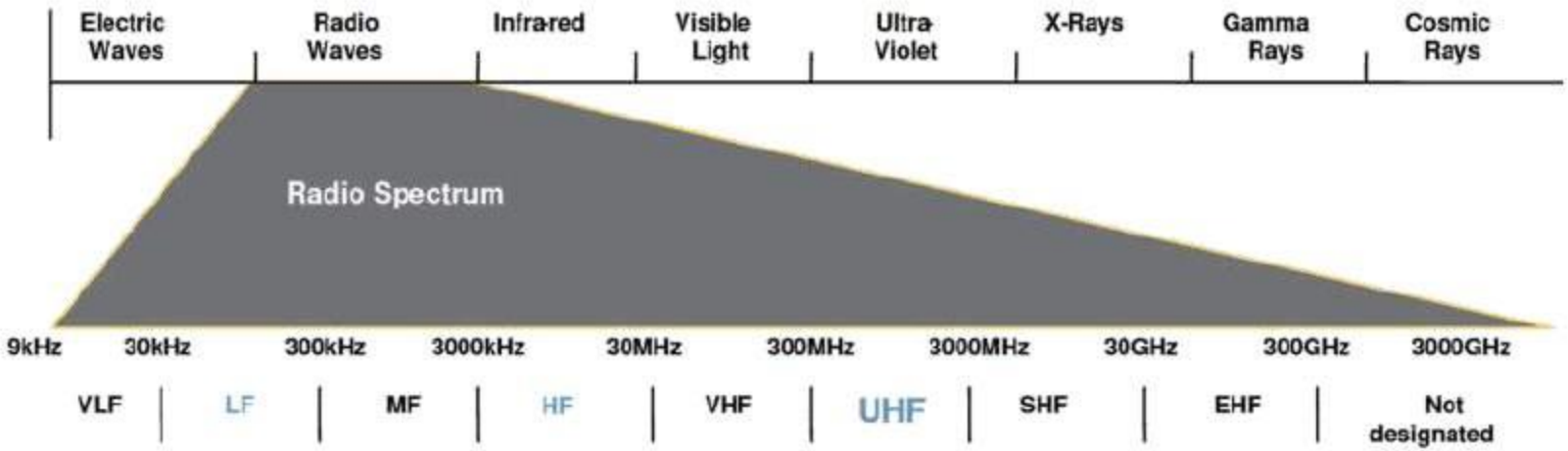
Connectivity (*har*-) for Devices in the Infrastructure

RFID technologie

Complete RFID System



Frequencies



VLF	Very Low Frequency	VHF	Very High Frequency
LF	Low Frequency	UHF	Ultra High Frequency
MF	Medium Frequency	SHF	Super High Frequency
HF	High Frequency	EHF	Extremely High Frequency

RFID in harsh environments

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as you can easily see…

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UHF RFID in theory

law of induction $$u_i = \oint E_i ds = -\frac{d\varphi(t)}{dx}$$

minimal energy of tag activation

$$H_{min} = \frac{(u_2)\left(\sqrt{\left(\left(\frac{L_2}{R_L} + \frac{R_2}{\omega_0^2 L_2}\right)^2\right) + \left(\frac{\omega_0^2 - \omega^2}{\omega_0^2} + \frac{R_2}{R_L}\right)^2}\right)}{\omega \mu_0 A N}$$

Challenges for RFID

- water, humidity
  - absorption
  - concrete
  - wood
  - humans
- metal
  - reflections
  - interferences
  - inhomogeneous electric field

Challenges for RFID

Pushing Performance

Metal

- reflection of wave
- interference of wave
- current eddies in metal
- detuning of antenna

Challenges for RFID

Pushing Performance

Water

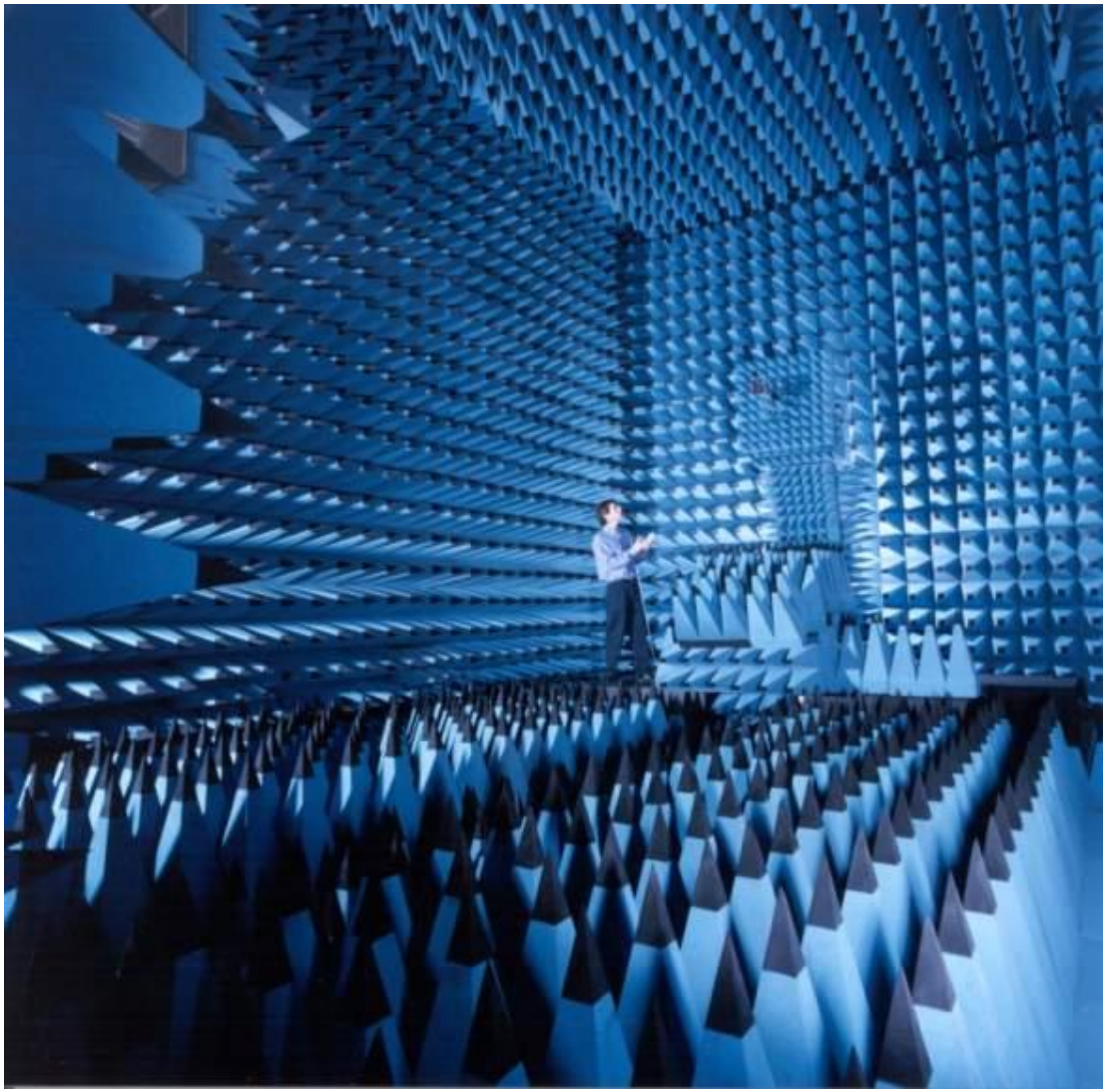
- absorption
- detuning of antenna

Challenges for RFID

Pushing Performance

Absorption

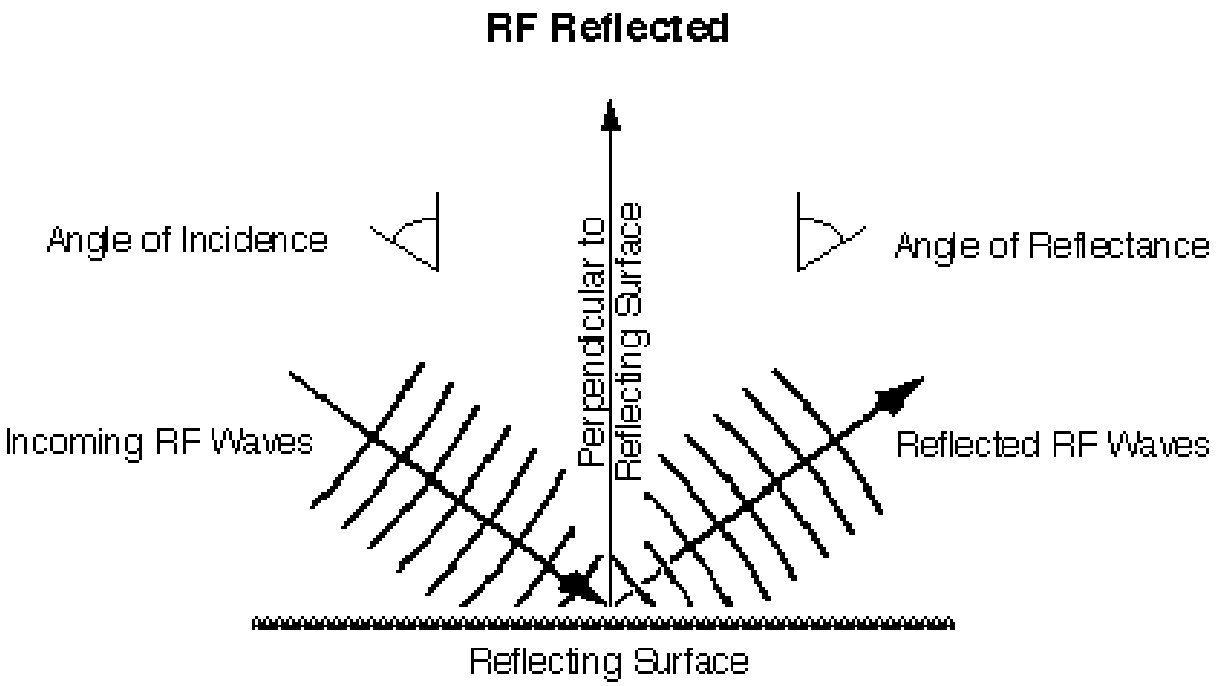
- **example: human body**



Challenges for RFID

Pushing Performance

Reflection



Challenges for RFID

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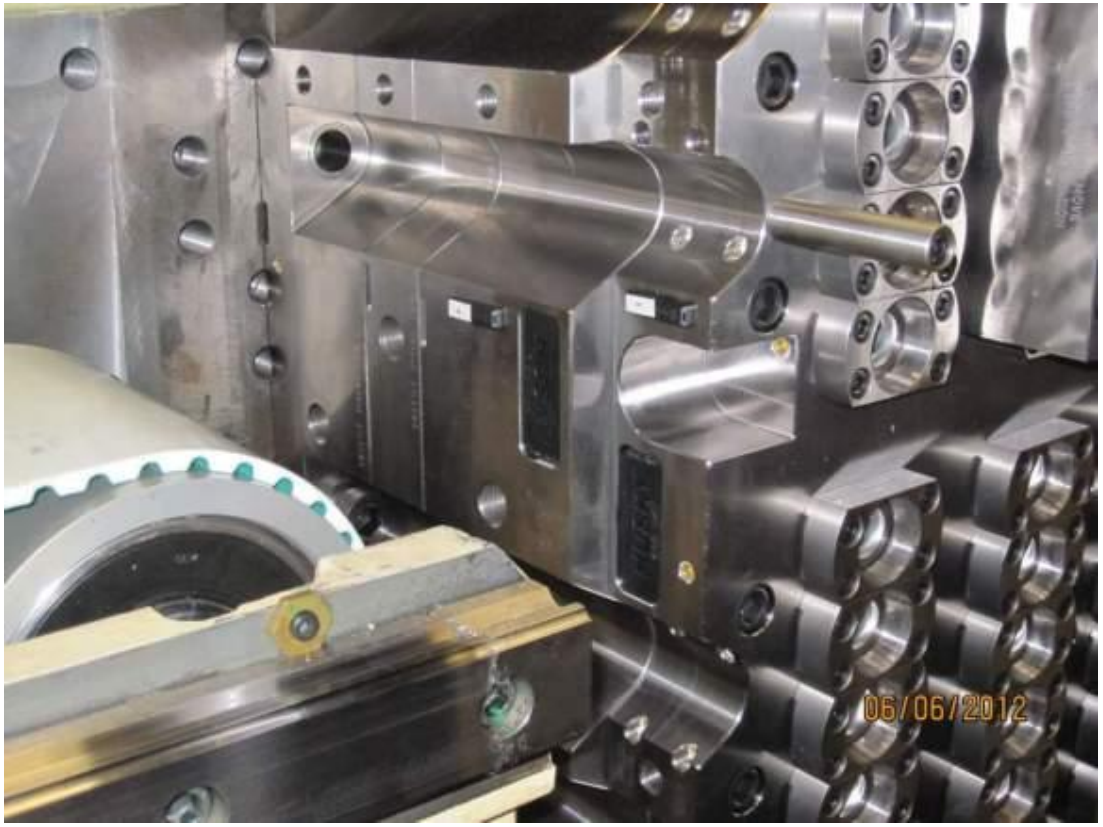
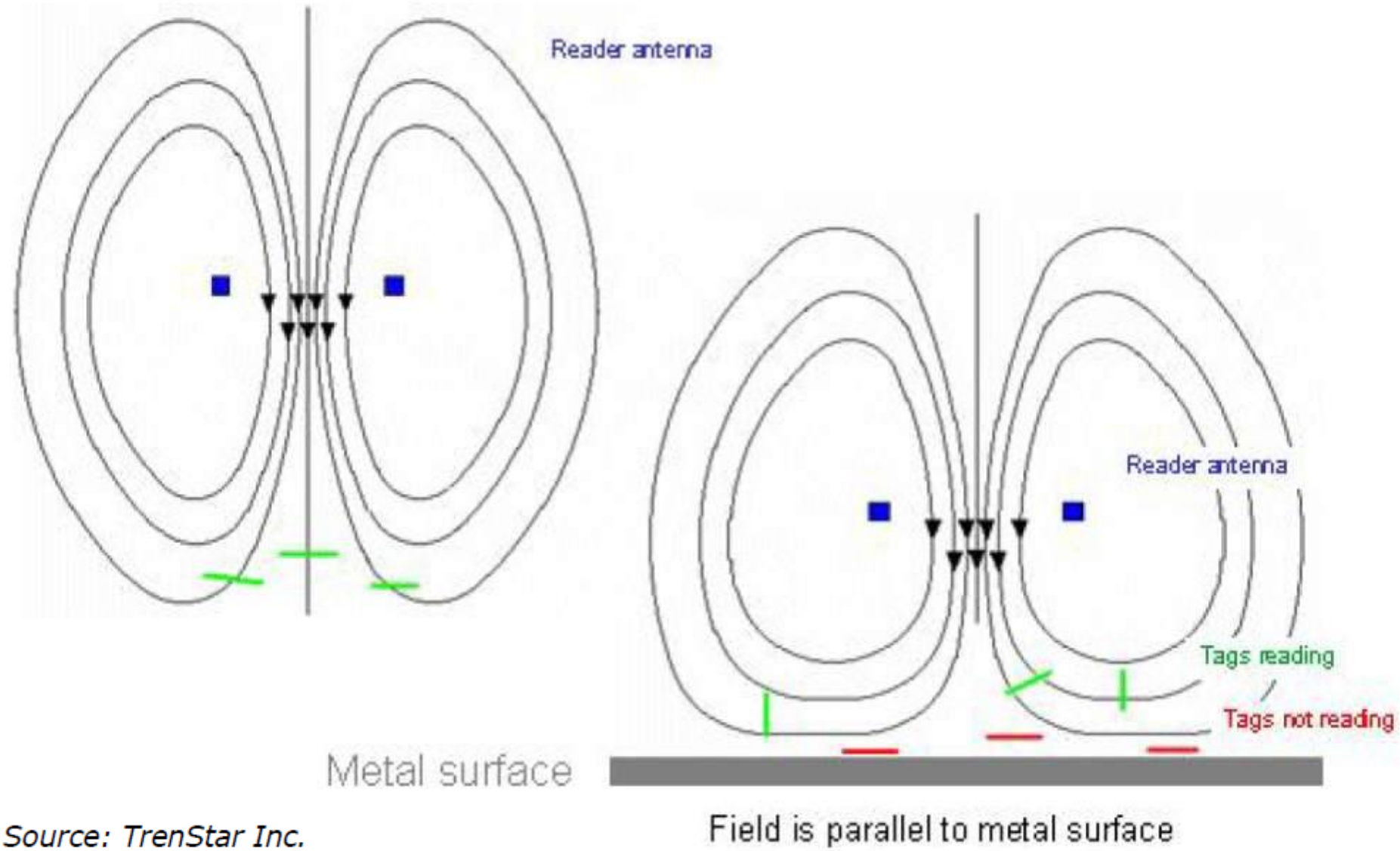
Reflection

- tool in molding machine



Challenges for RFID

law of induction



Source: TrenStar Inc.

Challenges for RFID

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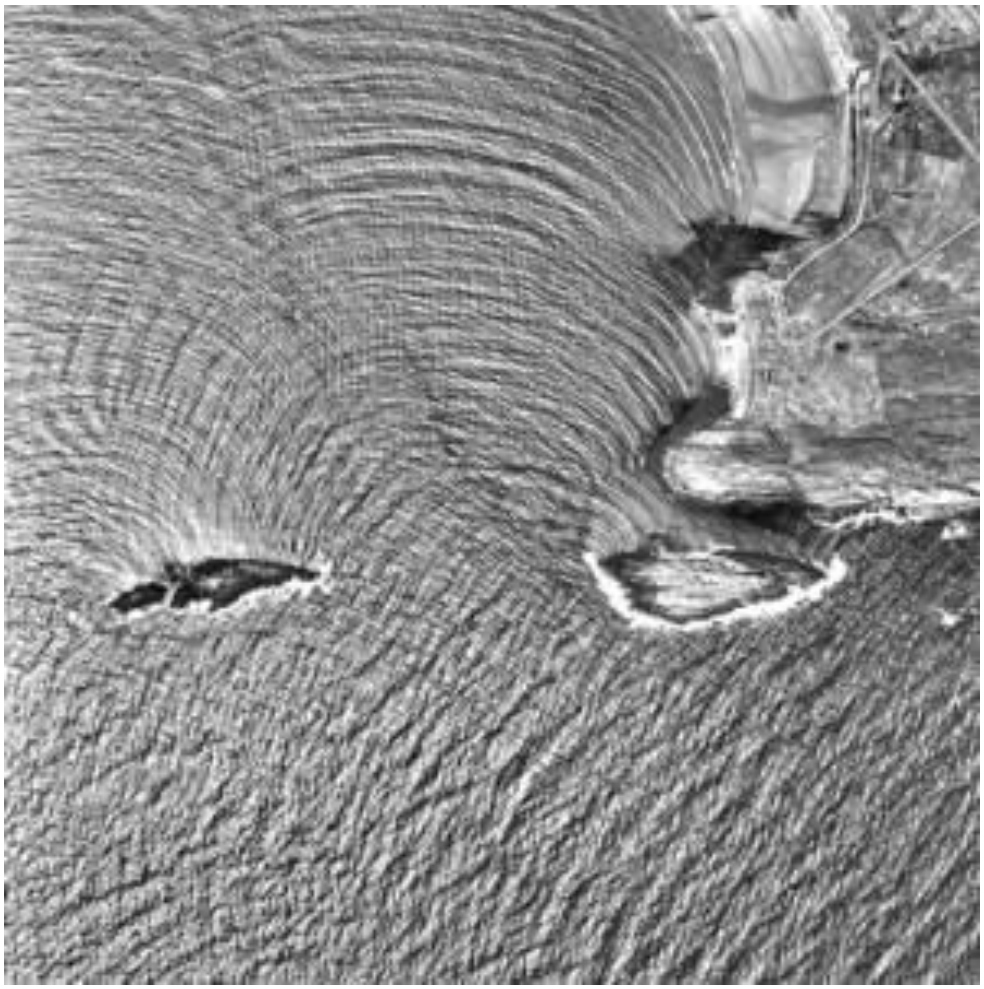
Interference

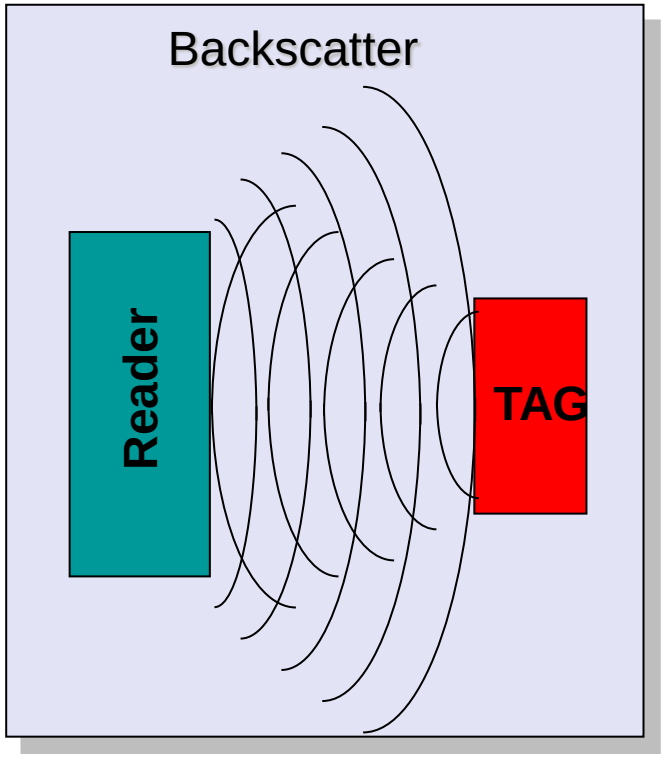
UHF best for moving objects

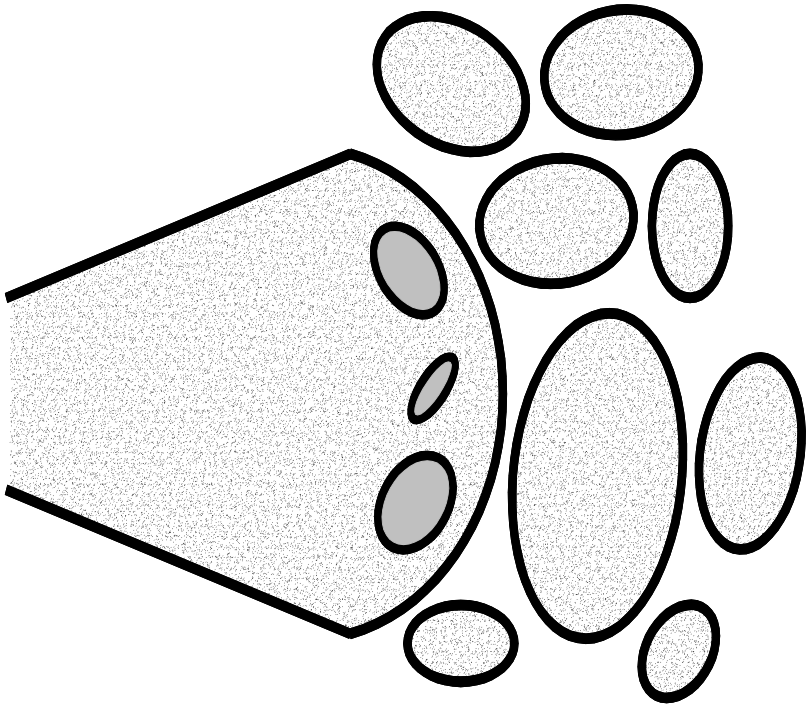


Challenges for RFID

Pushing Performance

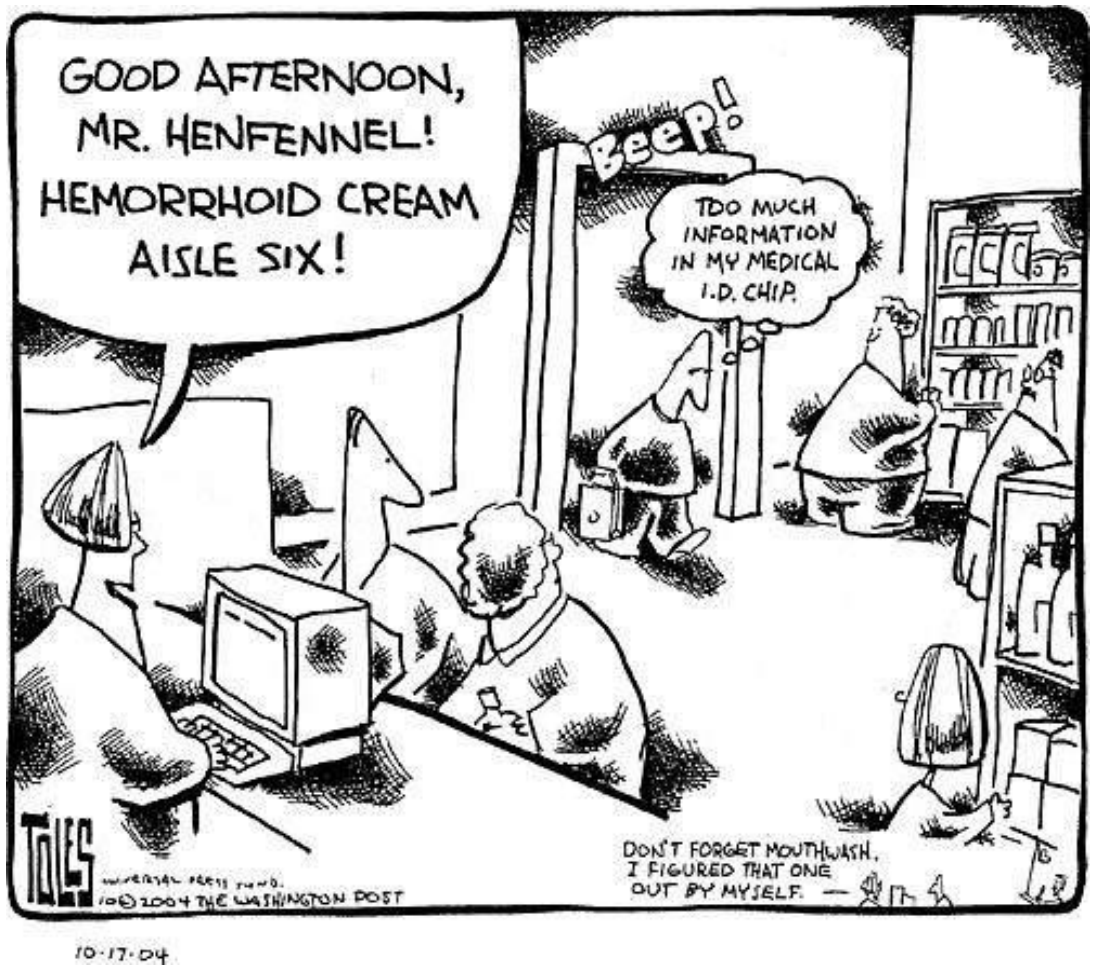
- **resulting inhomogeneous electromagnetic field**





Challenges for RFID

Privacy



RFID technology

	125 kHz LF	13.56 MHz HF	865 - 960 MHz UHF	2.45 GHz
Water & humidity	↗	↗	→ HARTING	↘
Metal environment	↗	→	↗ HARTING	↗
Read range	→	→	↗	↗
Anti collision	↘	↗	↗	↗
Continous Operation (Duty Cycle)	↗	↗	↗	↘
Costs per transponder	↘	→	↗	↗

HARTING

RFID@HARTING

Total RFID solution

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Modular design principle (MDP)

- every solution has different requirements
- Ha-VIS RFID system components generate customer specific „total RFID solution“

Complete RFID systems

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HARTING Solution

- Services
- Middleware / PLC
- RFID Box
- Reader
- Antenna
- Transponder











People | Power | Partnership

Ha-VIS RFID Transponder

Ha-VIS RFID Transponder

Pushing Performance

UHF tags for hard & rough environmental conditions!

- No low - price smart labels (disposable tags)
- Creating Hard-Tags
- Creating Permanent-Tags
- Creating Tags for the HARTING- Target- Markets
  - Machinery/ Automation
  - Transportation
  - Logistics



RFID Transponder for special applications

Pushing Performance

VT86

Identification of metal objects

SL89

Identification of
metal containers and vehicles

CT89

Identification of concrete parts

Ha-VIS RFID Transponder

Pushing Performance

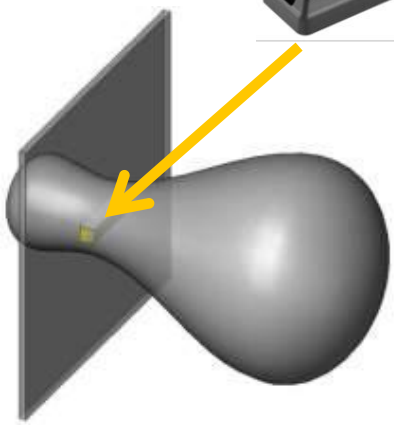
Aviation project with LTL results in Ha-VIS RFID VT86

- extremly ruggedized an compact on-metal tag for MRO-processes (Maintenance, Repair and Overhaul).

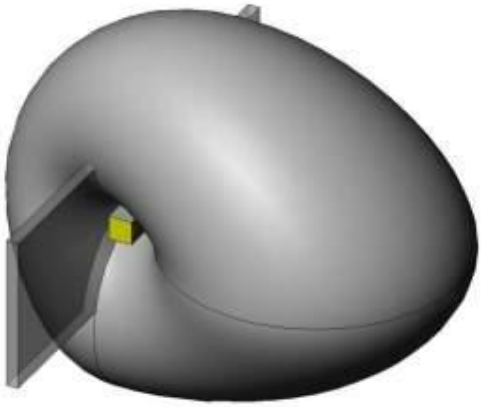
- MID technology – 3D antenna
- Size 41 x 11 x 5 mm
- Read Range of 2,5 m on metal
- Resistance against the red list of fluids
- Temperature range of –65°C up to 210°C
- Adhesive bonding

VT86 – **Radiation fields overview**

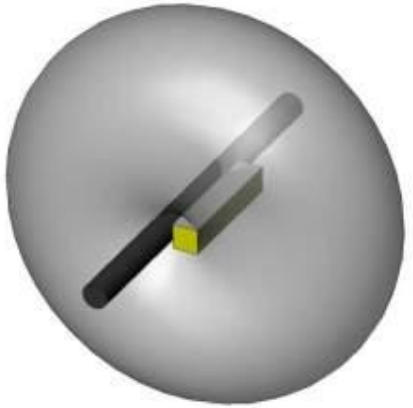
quadrat

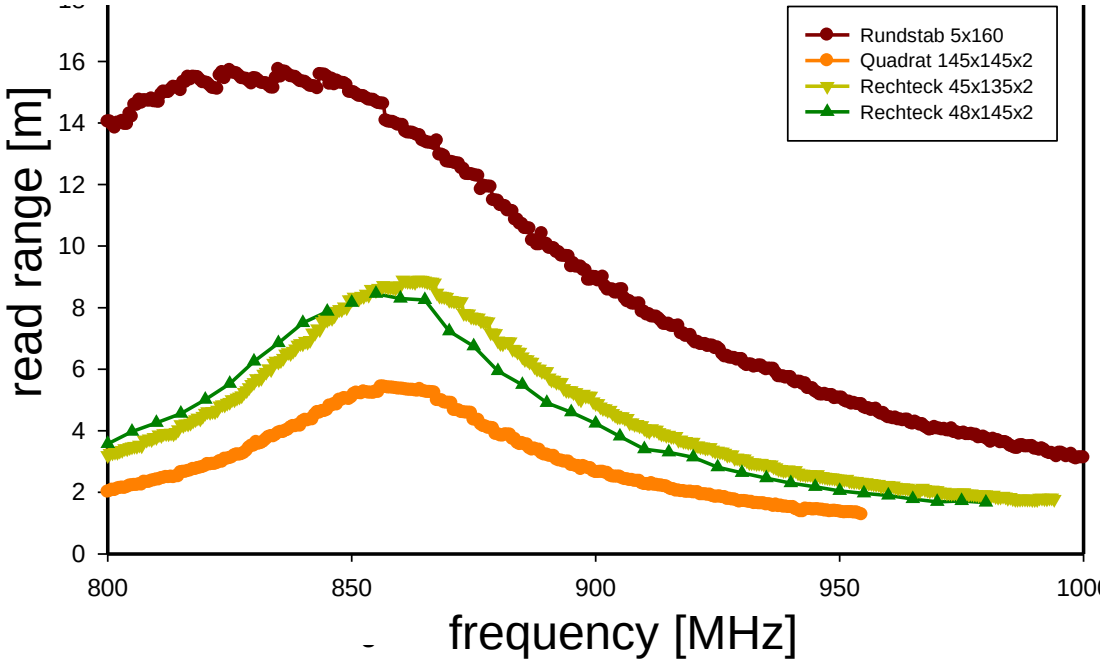


rectangle



round bar





Ha-VIS RFID Transponder

Pushing Performance

Ha-VIS RFID SL 89 for special applications integrated in metallic ambience

- Size 30 x 26 x 5 mm
- Read Range over 10 m
- Function in metal
- Temperature range of –40°C up to 85°C
- Degree of protection up to IP69k

Steel-container

Beer-Barrel

Iron pipe

In metal

Railway

Set of wheels

Ha-VIS RFID Transponder

Pushing Performance

Ha-VIS RFID CT 89, CF 89, CS 89 Transponder for wet surfaces and concrete

- Another challenging ambience for RFID Transponder is concrete

- Read Range 5 m
- Temperature range of –40°C up to 85°C
- Degree of protection up to IP69k

Building Industrie

Concrete Applications

Concrete floor

Location from Storage Areas

Reinforcement

Concrete Applications

RFID Reader

Pushing Performance

stationary, out-of-the-box

- excellent performance in difficult environments
- decoding algorithms
- noise suppression
- signal filtering

People | Po

RFID Antennas

- **Read ranges from 1 cm to 10 m**
- **IP 65/67**
- **excellent performance in difficult environments**

-30dBi

+4 dBic

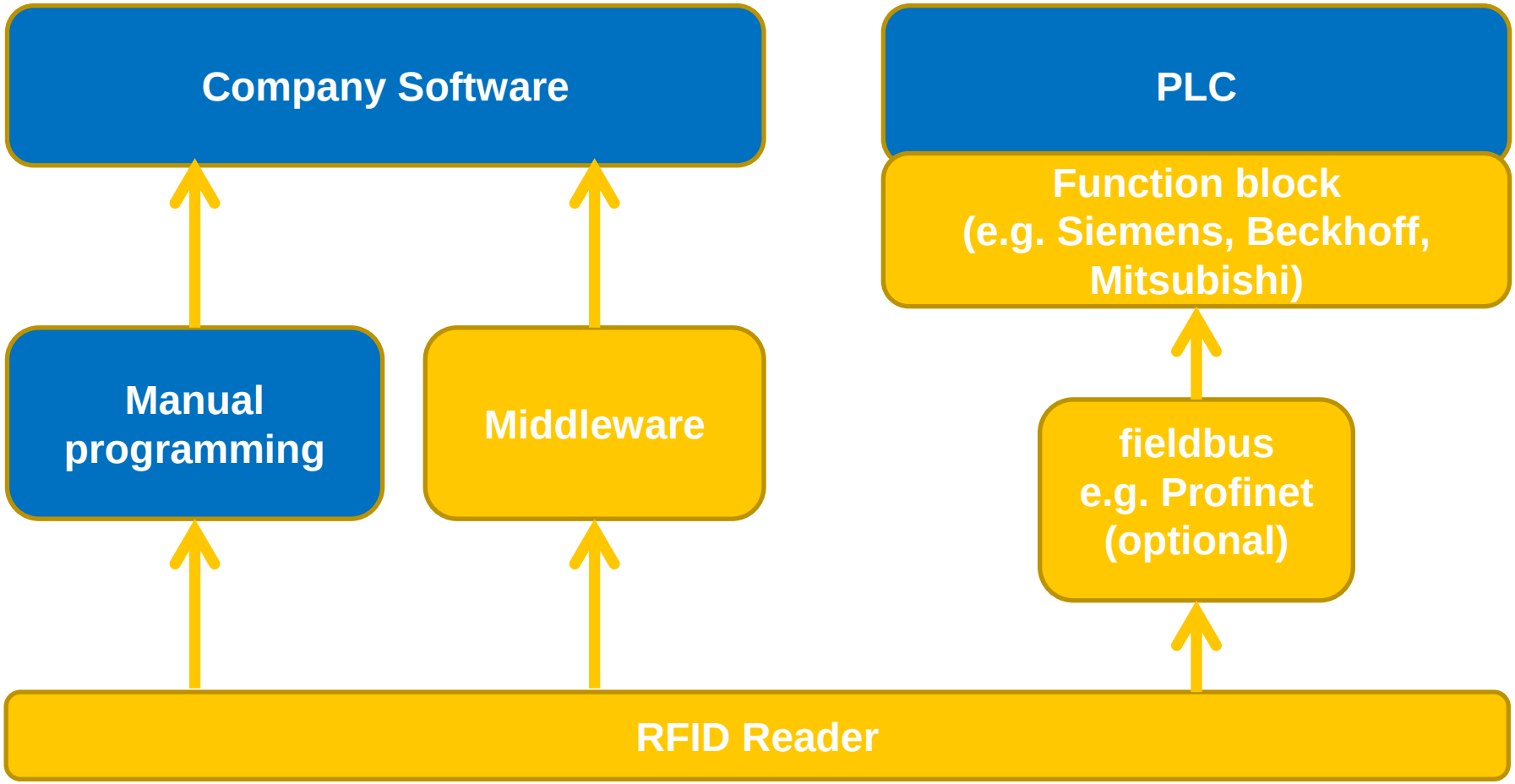
-12 dBic

+8.5 dBic

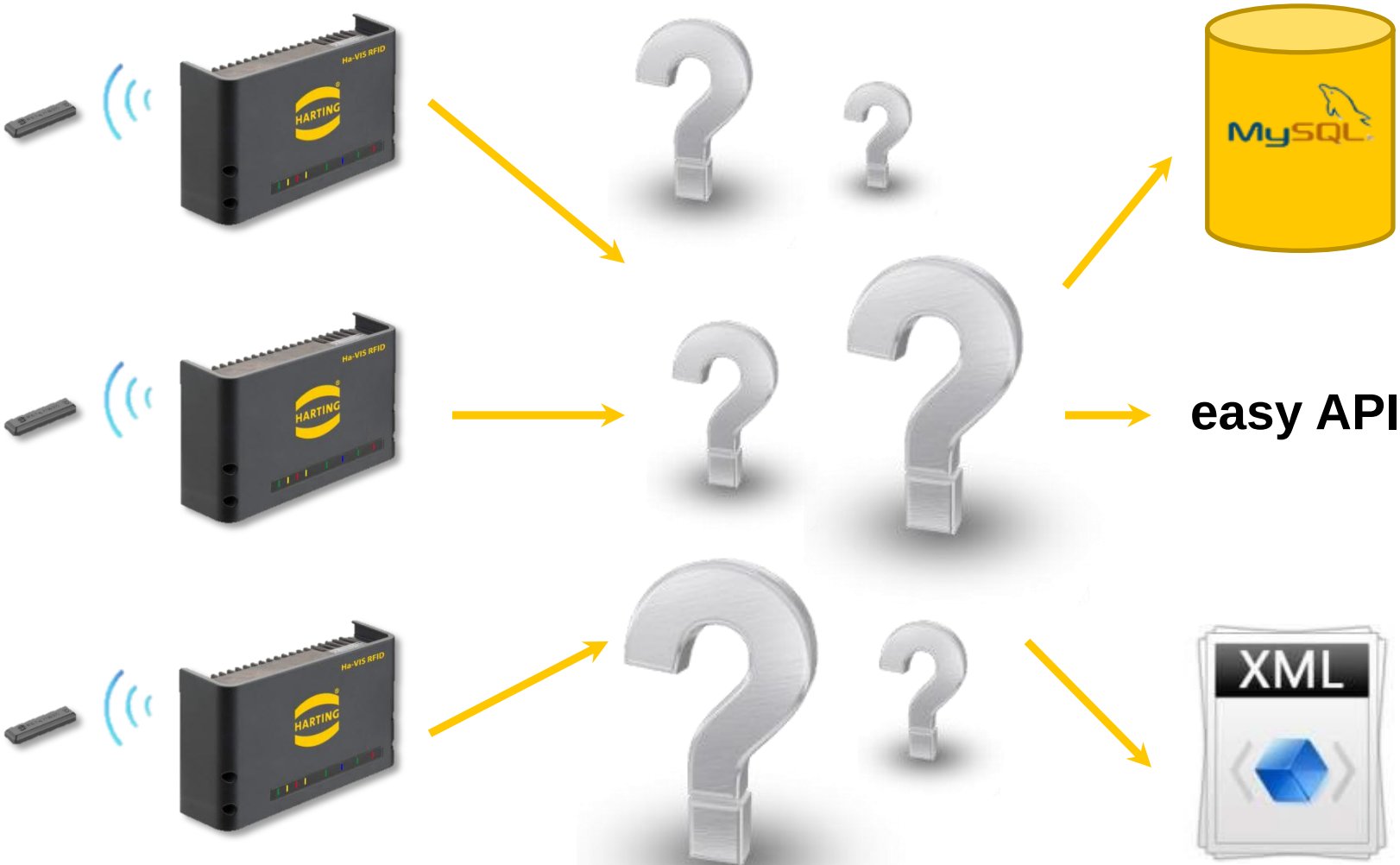
+11 dBic

Software

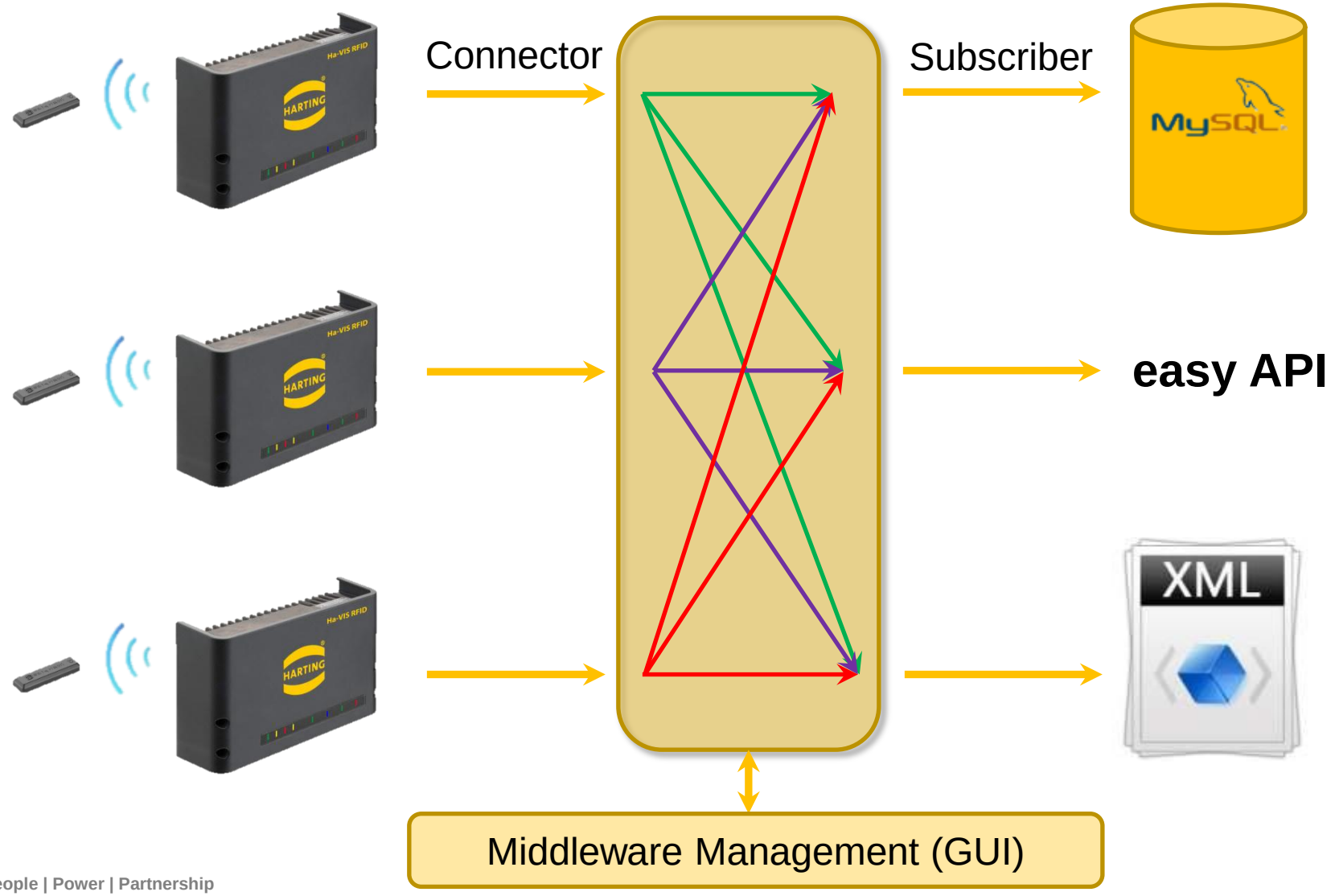
Strategies of connecting the RFID reader



Why Ha-VIS Middleware?



Ha-VIS Middleware



Applications

RFID Target Markets

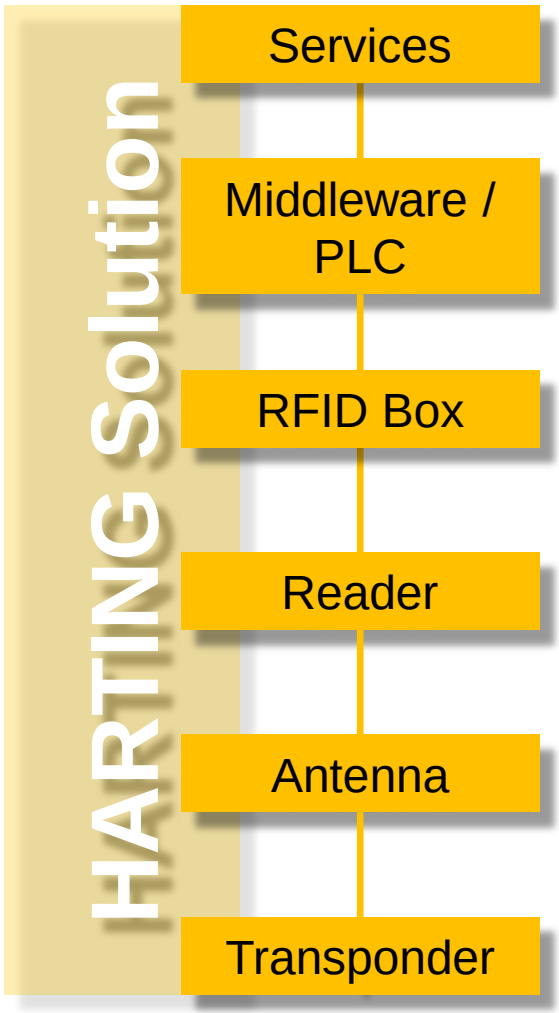
Pushing Performance

Transportation

Machinery and Automation

Logistics in Industry

Applications



Tracking of metal pieces

RFID Reader in machines

Identification of concrete parts

Tracking of vehilces

Tool identification

Track side reading

Combination Barcode & RFID

Example 1/4
RFID in machine

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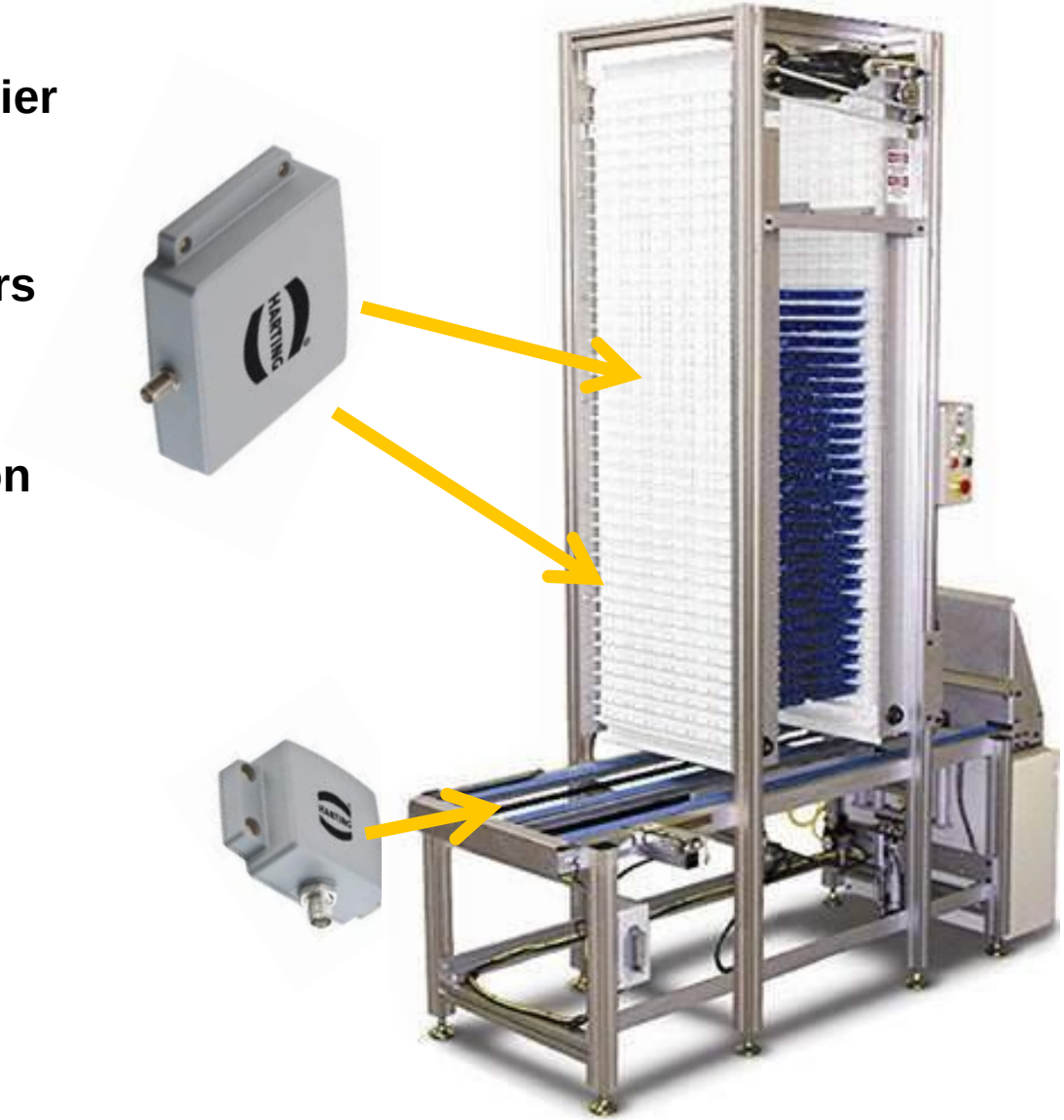
Automotive supplier

- RFID replaces 4 photo sensors
- more reliable process
- PLC connection



Example 2/4
Tracking vehicles in harbor

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Identification of stackers

- big harbor operator
- optimize process
- data transparency
- extremely rugged tags

Example 3/4
Maintenance of trains

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- tags on all important parts of locomotive
- use handheld for identification
- keep record of maintenance in databse

Example 4/4
ekanban

HARTING RFID mini lab

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Please visit us at JAI

- test our products
- learn more about RFID
- do experiments with RFID tags in difficult environments

Summary

Pushing Performance

- from transponder to middleware / PLC connection
- excellent RFID systems for challenging environments

Questions?

thank you

for your attention