

New Automation Technology

PC-based control for wind turbines

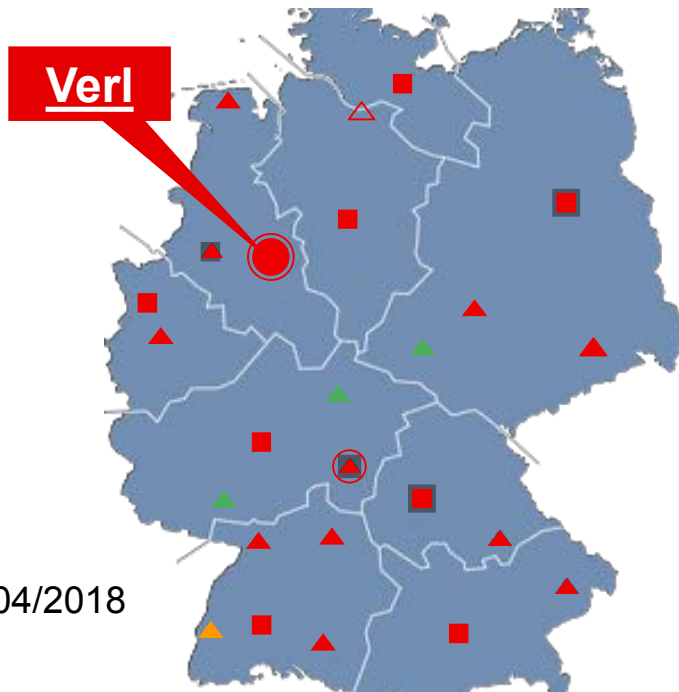
BECKHOFF



Facts and figures

BECKHOFF

Headquarters:	Verl, Germany
Employees worldwide:	3,900
Number of engineers:	1,400
Sales/technical offices in Germany:	22
Beckhoff companies worldwide:	37 countries
Subsidiaries and distributors:	75 countries
Sales worldwide 2016	679 million € (+9.5 %)
Sales worldwide 2017	810 million € (+19 %)



as of: 04/2018



Sales network Germany

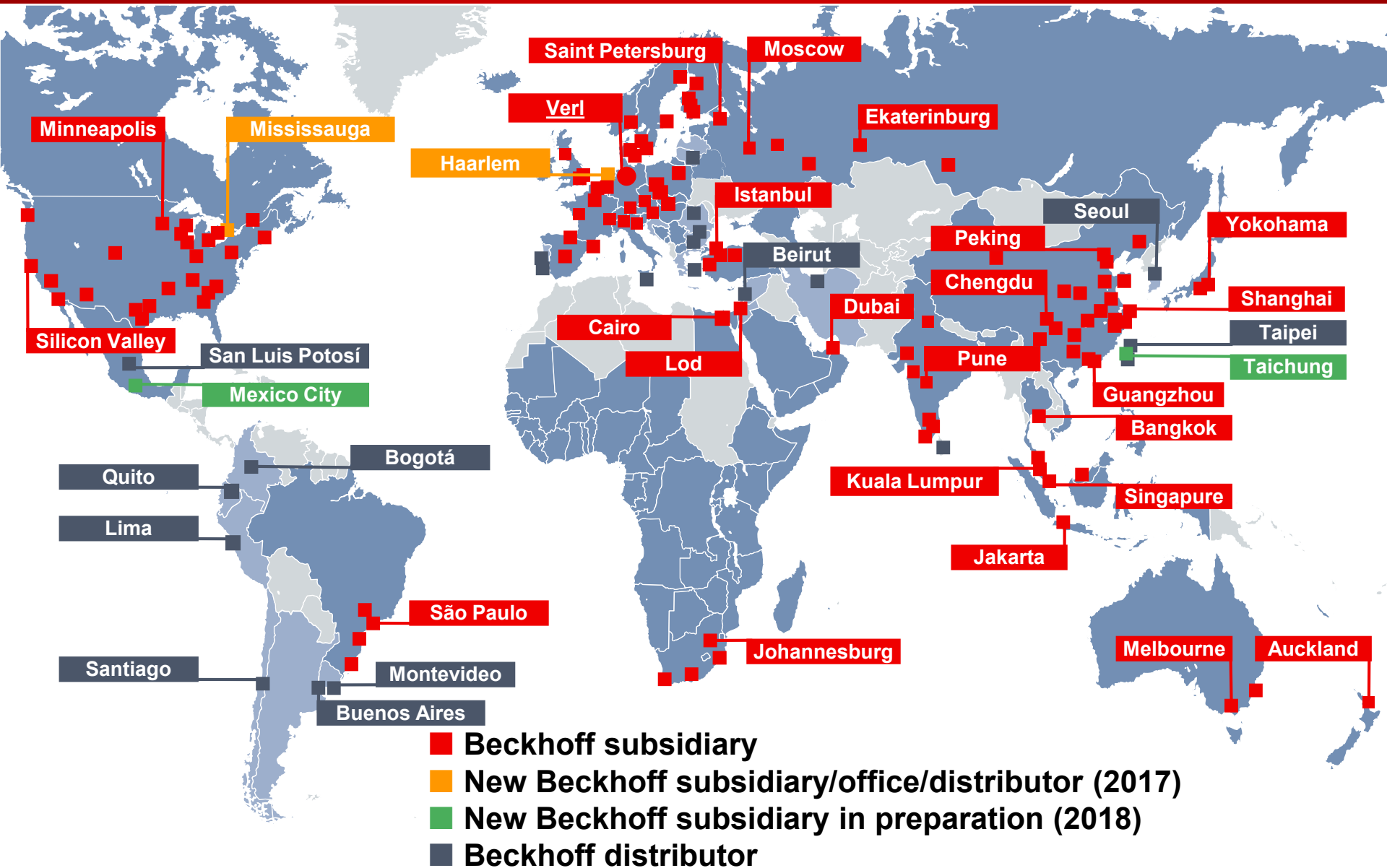
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- Headquarters
- Office
- Development Center
- ▲ Sales Office
- ▲ New Offices 2017
- ▲ New Offices 2018
- △ Technical Office
- Production



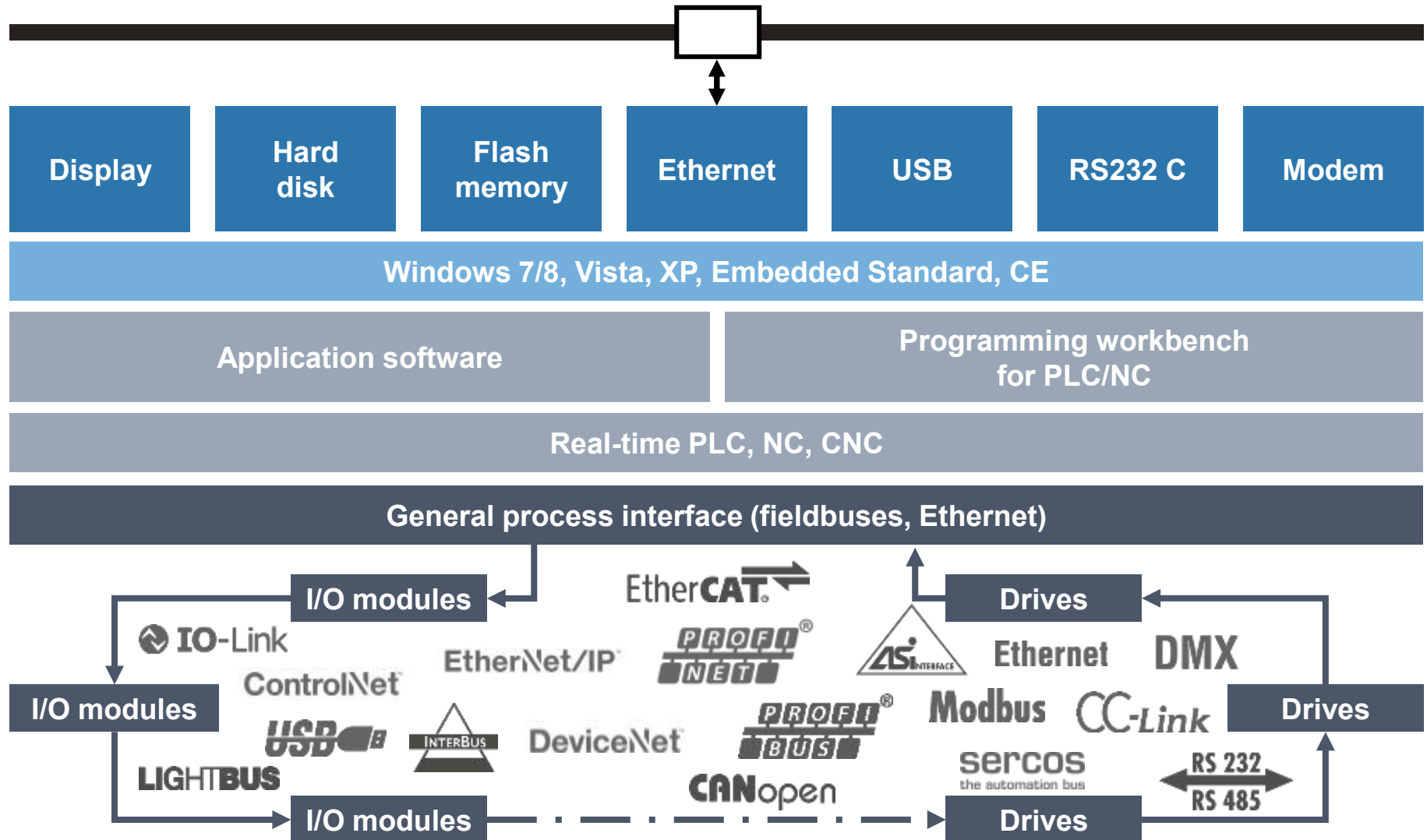
- Beckhoff subsidiary
- New Beckhoff subsidiary 2017
- New Offices in 2018
- Beckhoff distributor





The concept of open control technology

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Products and system solutions

BECKHOFF

Industrial PC



EtherCAT Box



TwinCAT



Embedded PC



Bus Terminal



EtherCAT



Infrastructure Components



Drive Technology



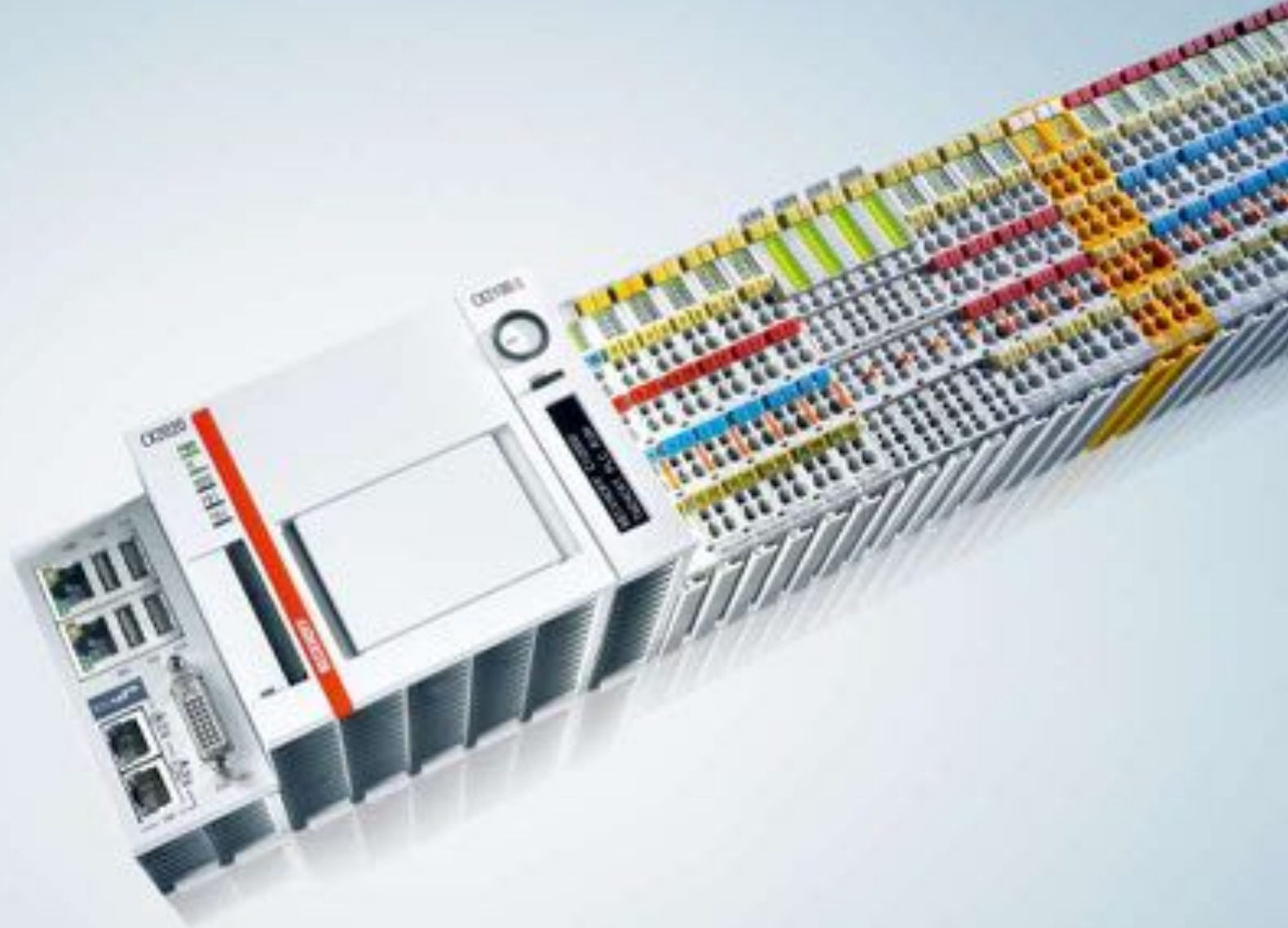
XTS





Embedded PCs

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Beckhoff | The I/O Company

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TwinSAFE: the compact safety solution

BECKHOFF



Applications and solutions

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Packaging



Window Production



Robotic



Tire



Plastic



Machine Tools



Woodworking



Forming



Printing



Applications and solutions

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Water Treatment



Photovoltaic



Automotive



Building Automation



Process Technology



Test Facilities



Shipbuilding



Stage Technology



Wind Turbines



Applications and solutions

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Semiconductor
Manufacturing



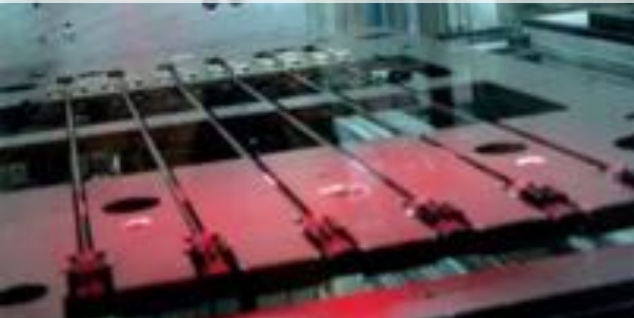
Medical Engineering



Energy Industry



Wire | Cable | Pipe



End User



Food Industry



Transport | Logistics

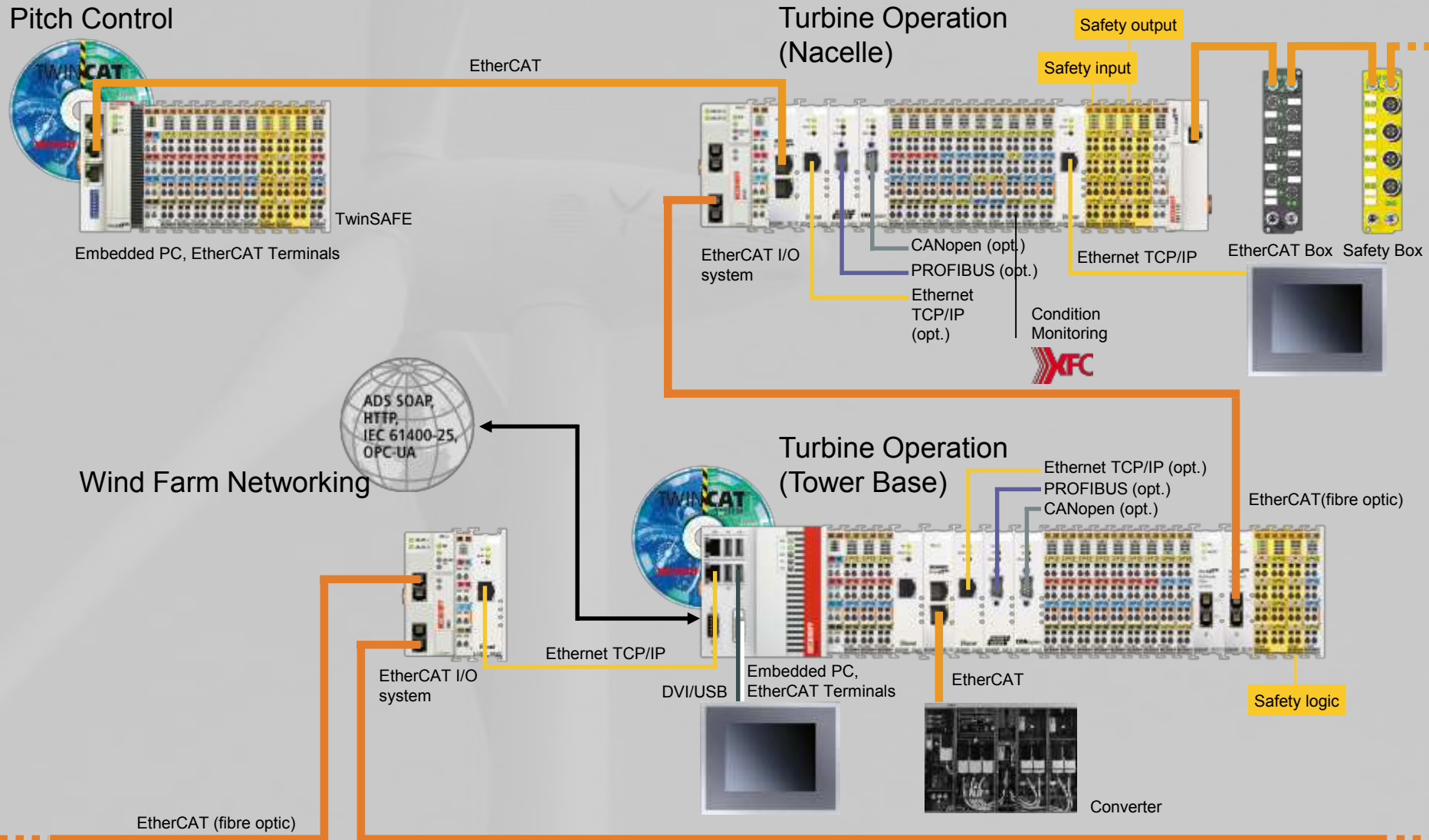


Textile Industry



Machine Building



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Blade
Monitoring

Environment
Monitoring

Drive Train
Monitoring

Blade Bearing
Monitoring

Tower
Monitoring

Power
Monitoring



- Black Boxes for each Monitoring Task
- Interface work for each device
- Each device contains own CPU and infrastructure components
- Each device needs additional Data like power, speed, windspeed etc.
- Measured values are not time synchronized
- Different data formats
- Data concentration (loss of data) in many devices
- Many different hardware suppliers
- High cost level

The Beckhoff Approach

1 Hardware, 1 Database, 1 Timebase, 1 Infrastructure

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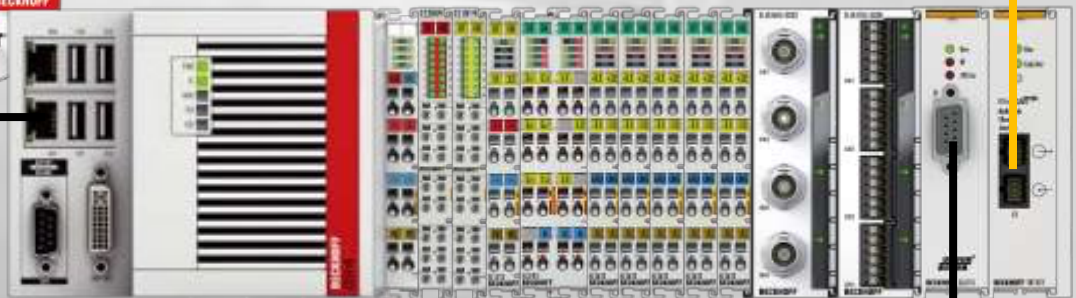
Hub

Nacelle

EtherCAT

Slipring

Electrical Power Monitoring



Ingenieurbüro
Trey
Blade Monitoring

Wölfel
Blade Monitoring
Tower Monitoring

iGfM
Drive Train Monitoring
Blade Bearing Monitoring

Interface to the WTC

Weidmüller
Blade Monitoring

8.2
Drive Train Monitoring

cms@wind
Drive Train Monitoring



The Beckhoff Approach

1 Hardware, 1 Database, 1 Timebase, 1 Infrastructure

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- One Hardware, one interface, one solution for all tasks
- Collection of all raw data
- All measured values are time synchronized $\ll 1 \mu\text{s}$
- All data could be stored in one data base
- Terminals for all relevant sensors are available
- Interfaces to the WTC are all available
- Power, speed, windspeed etc. are available for all tasks
- 3rd party software suppliers offer software for all monitoring tasks on a turbine
- Licensing for 3rd party software based on TwinCAT3 licensing
- Ability to integrate own measurement campaigns into the system

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