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SIPROTEC 5

Release V08.30

siemens.com/siprotec5

SIPROTEC 5 –
The benchmark for protection, automation and monitoring

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Individually configurable devices –
Save money over the entire life cycle

Trendsetting system architecture –
Flexibility and safety for all kind of grids

Multi-layered integrated safety mechanism –
Highest possible level of safety and availability

Consistent system and device engineering –
Efficient operating concepts, flexible engineering

Powerful intelligent, digital protection relays with a high degree of modularity

SIPROTEC 5 relays
Proven solution for all applications

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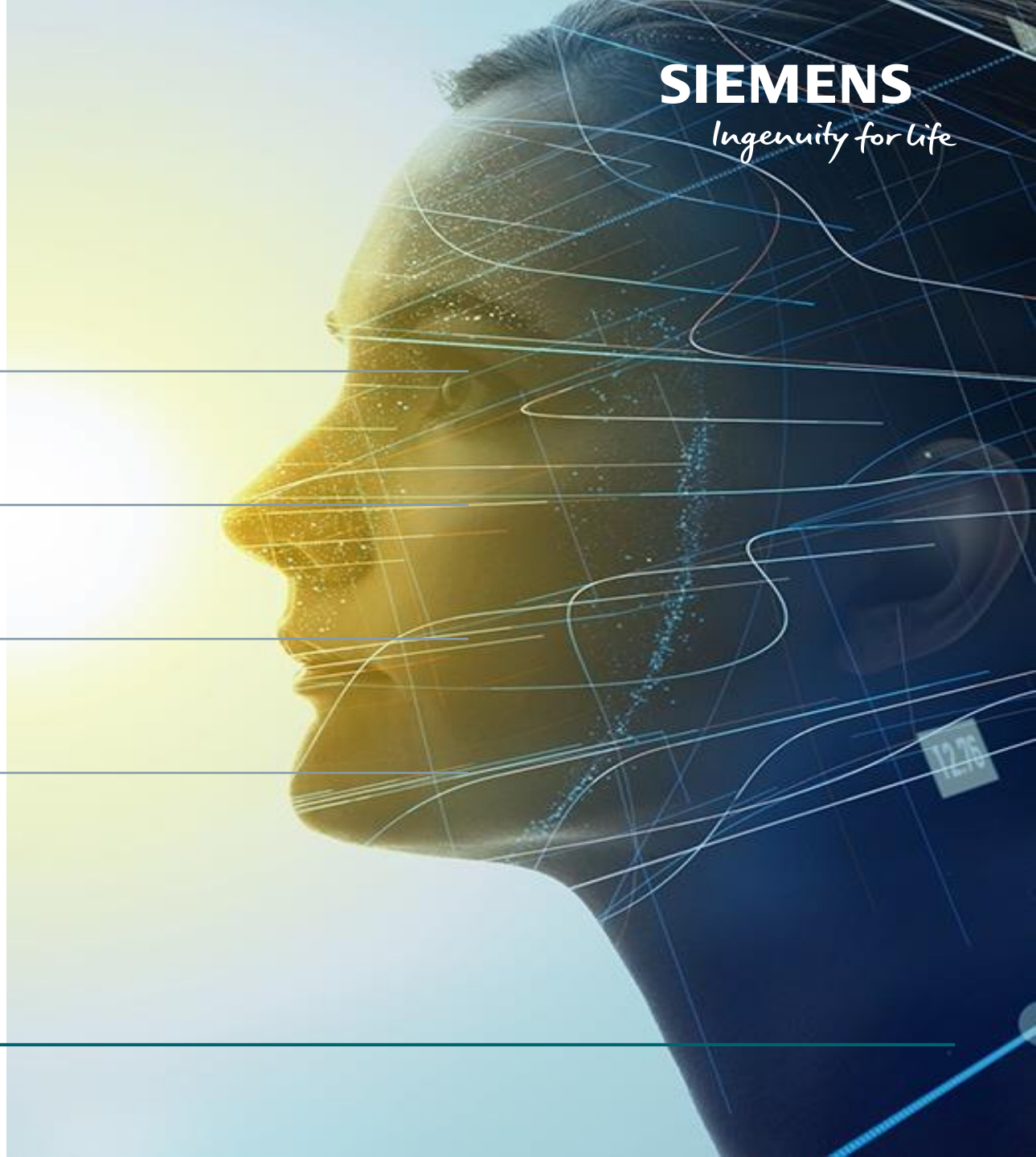
7SJ8	Overcurrent and feeder protection
7SA8	Distance protection
7SD8	Line differential protection
7SL8	Combined line differential & distance protection
7UT8	Transformer differential protection
7VE8	Paralleling device
7SS85	Busbar protection
7SK8	Motor protection
7VK8	Breaker management
7UM85	Generator protection
6MD8	Bay controller
7KE85	Fault recorder
6MU85	Merging unit

Easy engineering and evaluation – DIGSI and SIGRA

Content



Content – Click on the picture for navigation

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Operation and user experience

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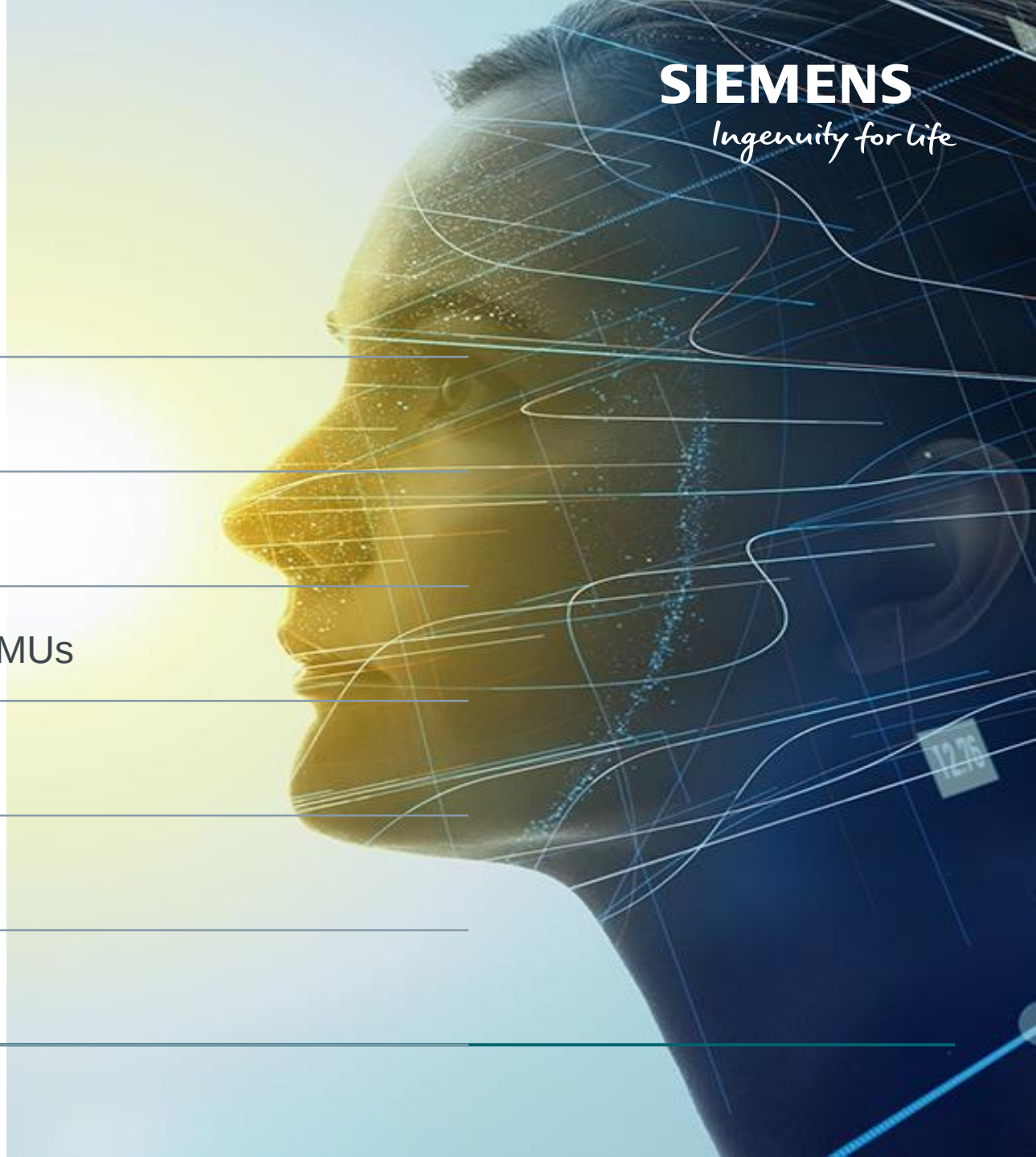
Content



NEW: Easier filtering of routing information

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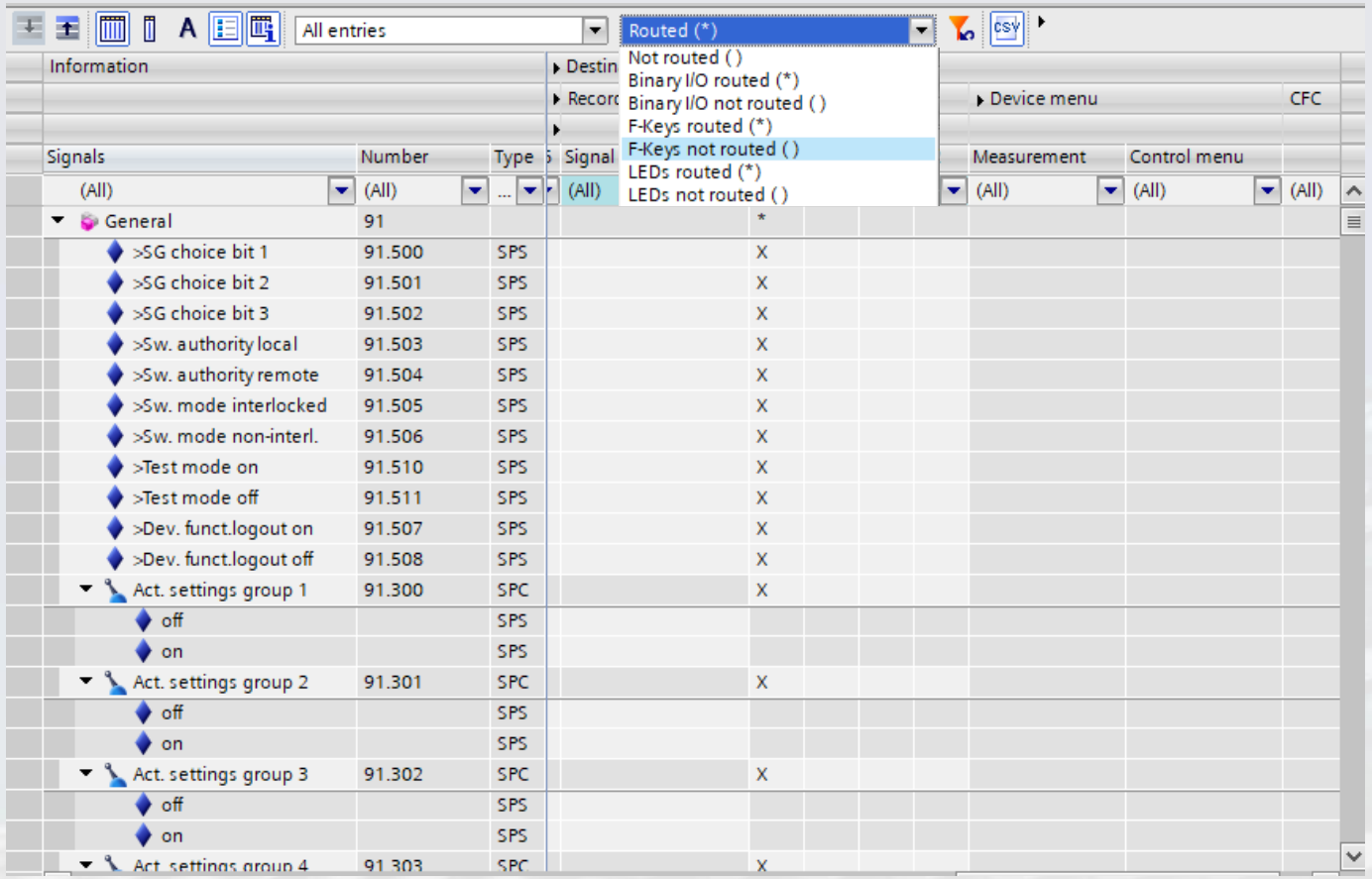

Simplify complexity

- Routing filter to your needs
- Binary inputs, F-Keys and LEDs

NEW: Your favorite settings at a glance

Easier setting of parameters with favorites

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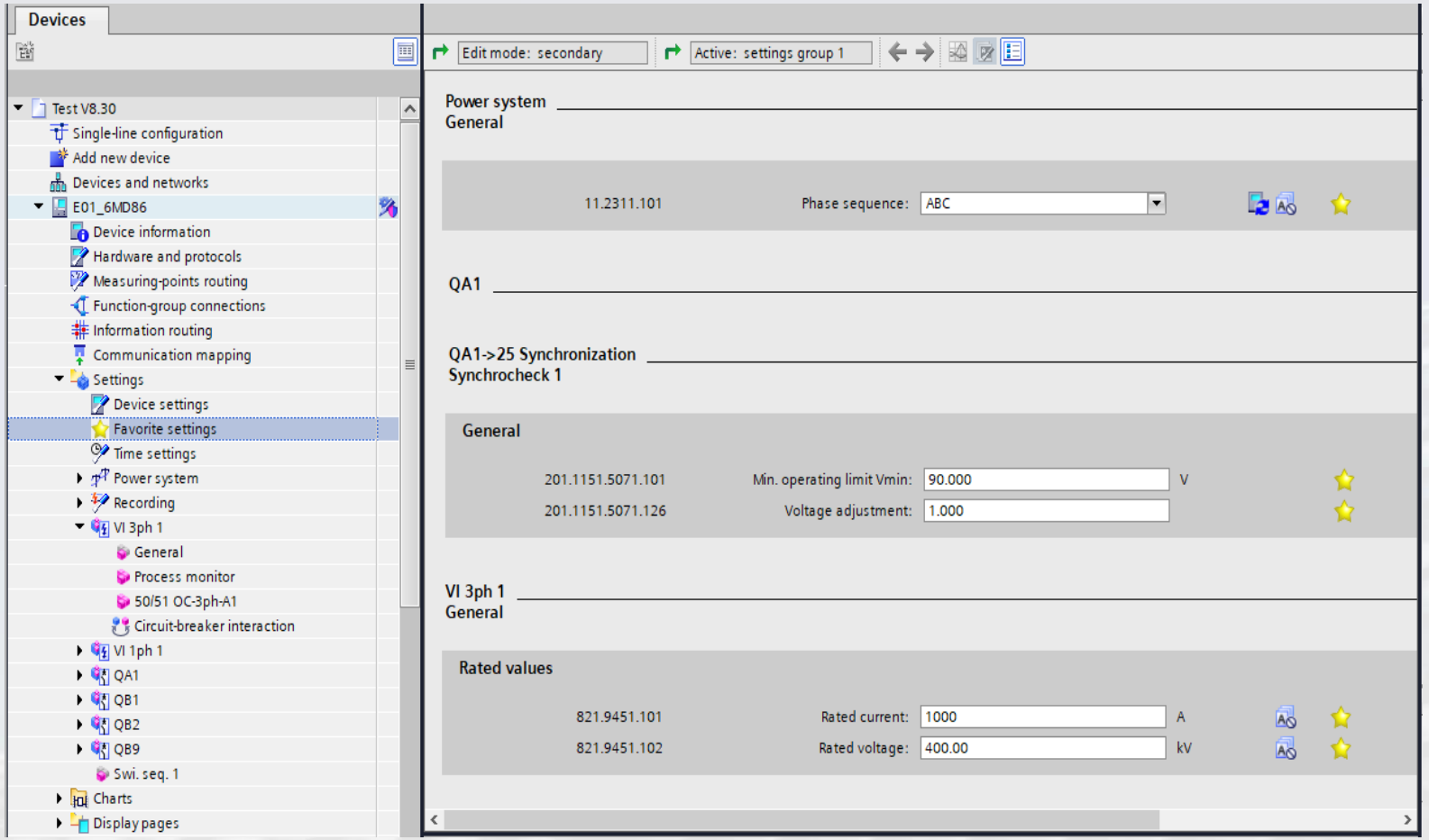
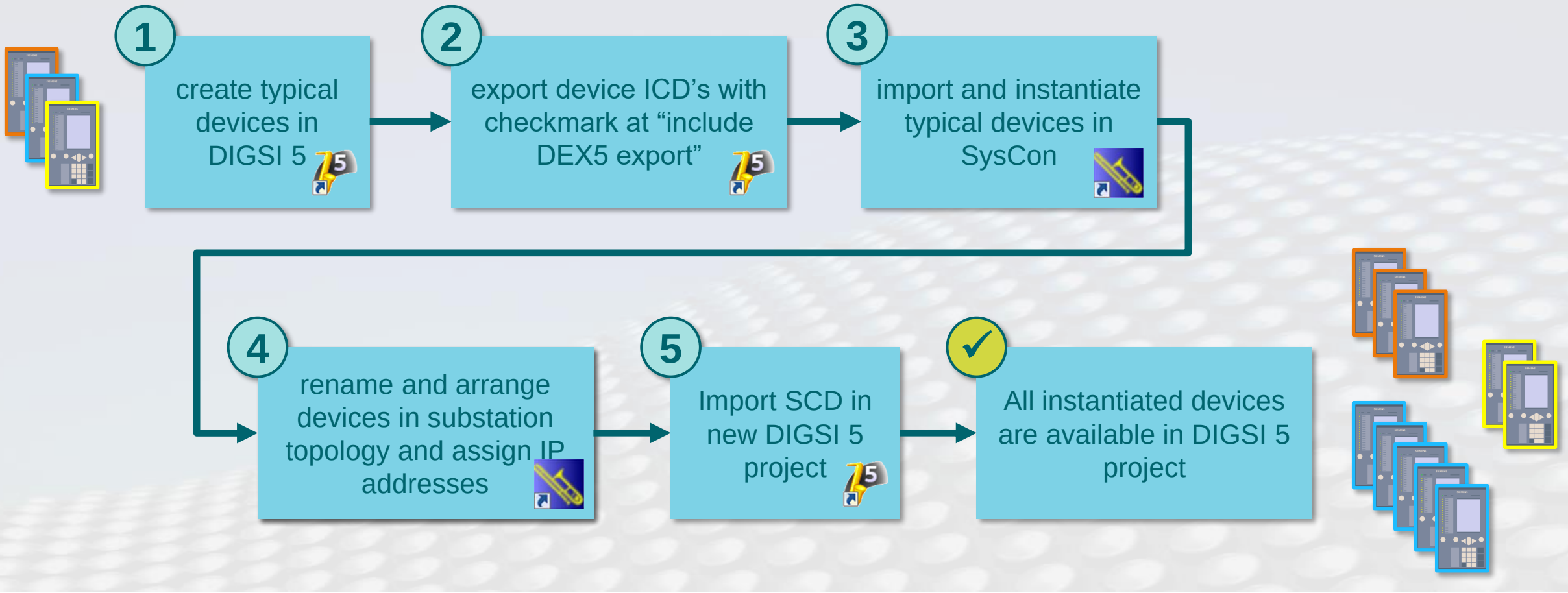


Simplify complexity

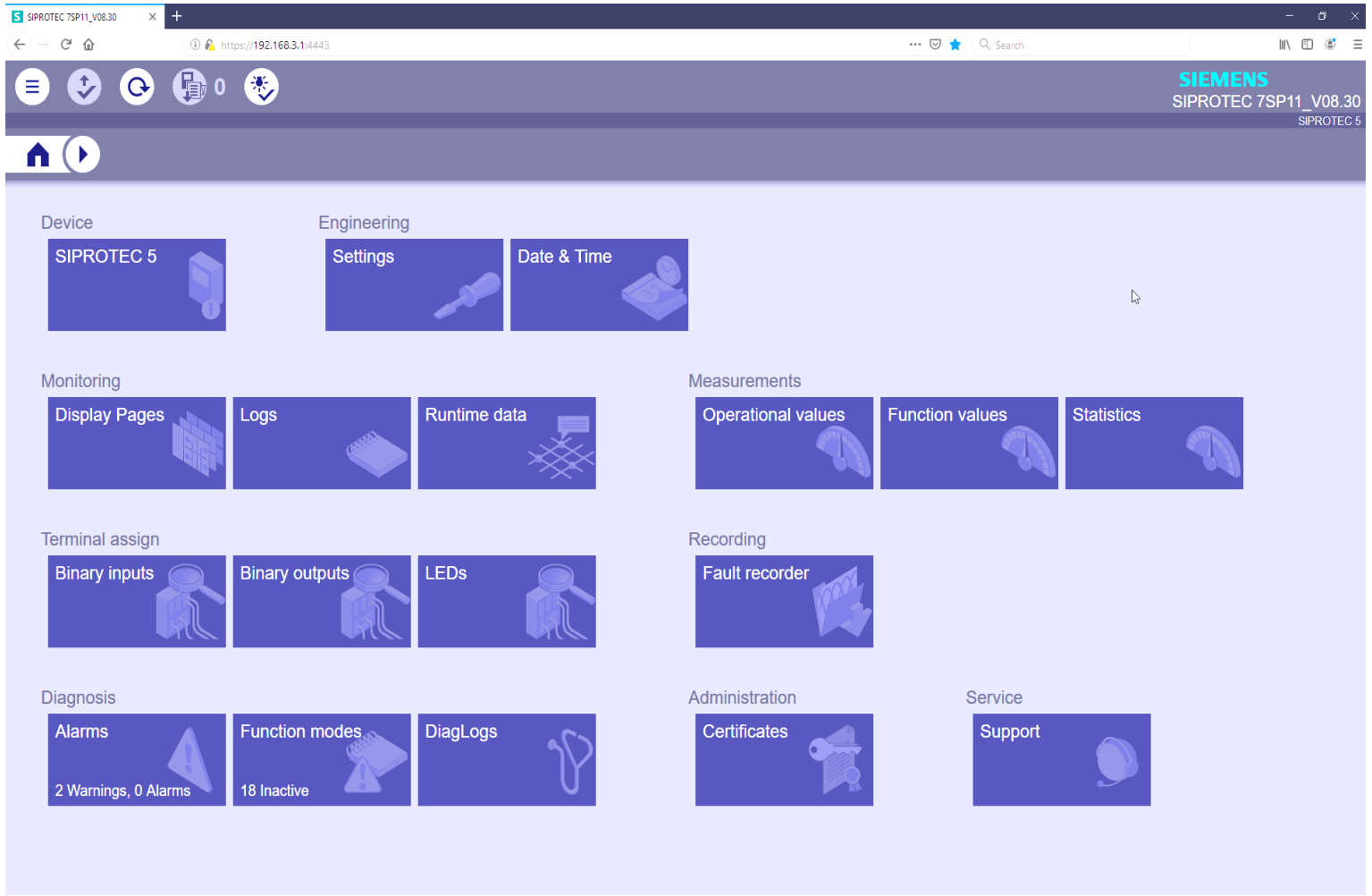
- All relevant settings at a glance
- Settings for one bay on one screen
- Reduced training
- Reduced risk of changing wrong parameter

NEW: Automated IEC 61850 engineering with bay typicals



Web Browser

Easy, fast and secure access to device



Monitoring:

- Logs and Measurements
- Centralized view on warnings, alarms and inactive functions
- Device diagnosis data

Download of:

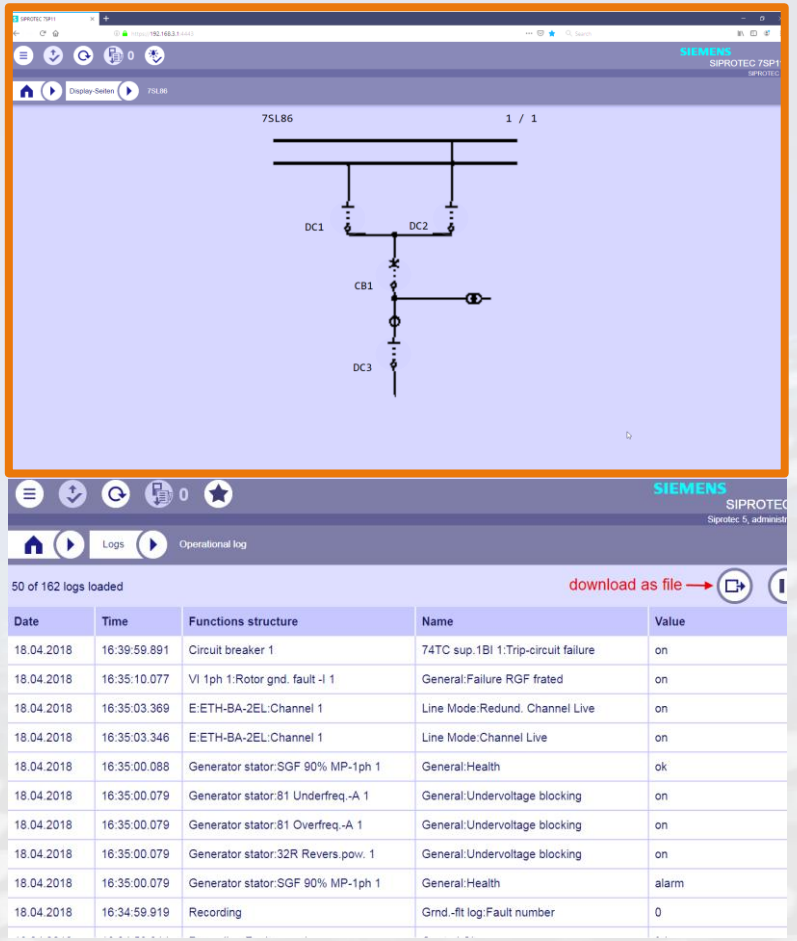
- Logs as CSV or COMFEDE files
- Records as COMTRADE files

Secure:

- https connection
- Access defined per port
- Controlled by RBAC

Web Browser

Easy, fast and secure access to device



Recording:

- Download, Delete and Trigger of Fault Records

Parameterization:

- Change of settings within an active setting-group

Display of:

- Indication of all information
- Vector diagrams of energizing quantities
- **NEW** Single line diagrams and device display pages
- Device diagnosis data

Diagnosis homepage of ETH-BD-2FO module

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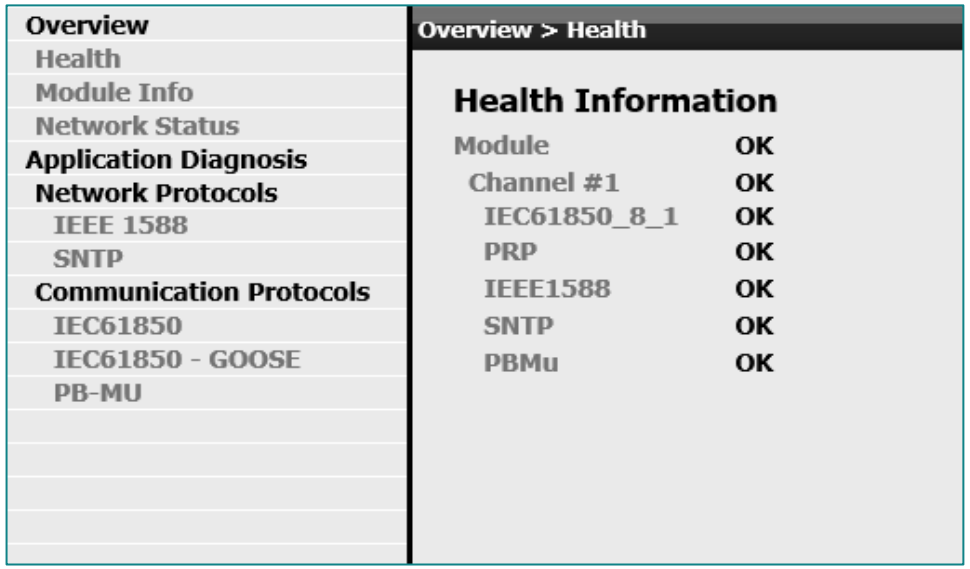
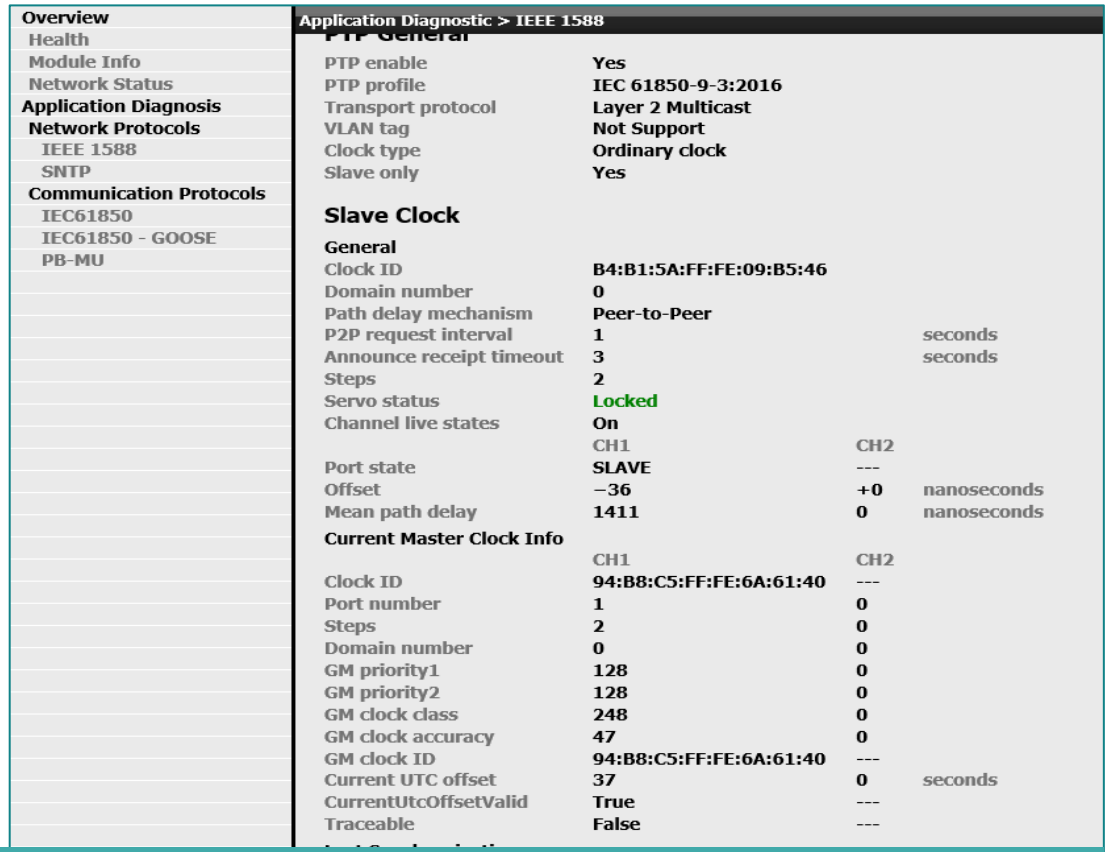
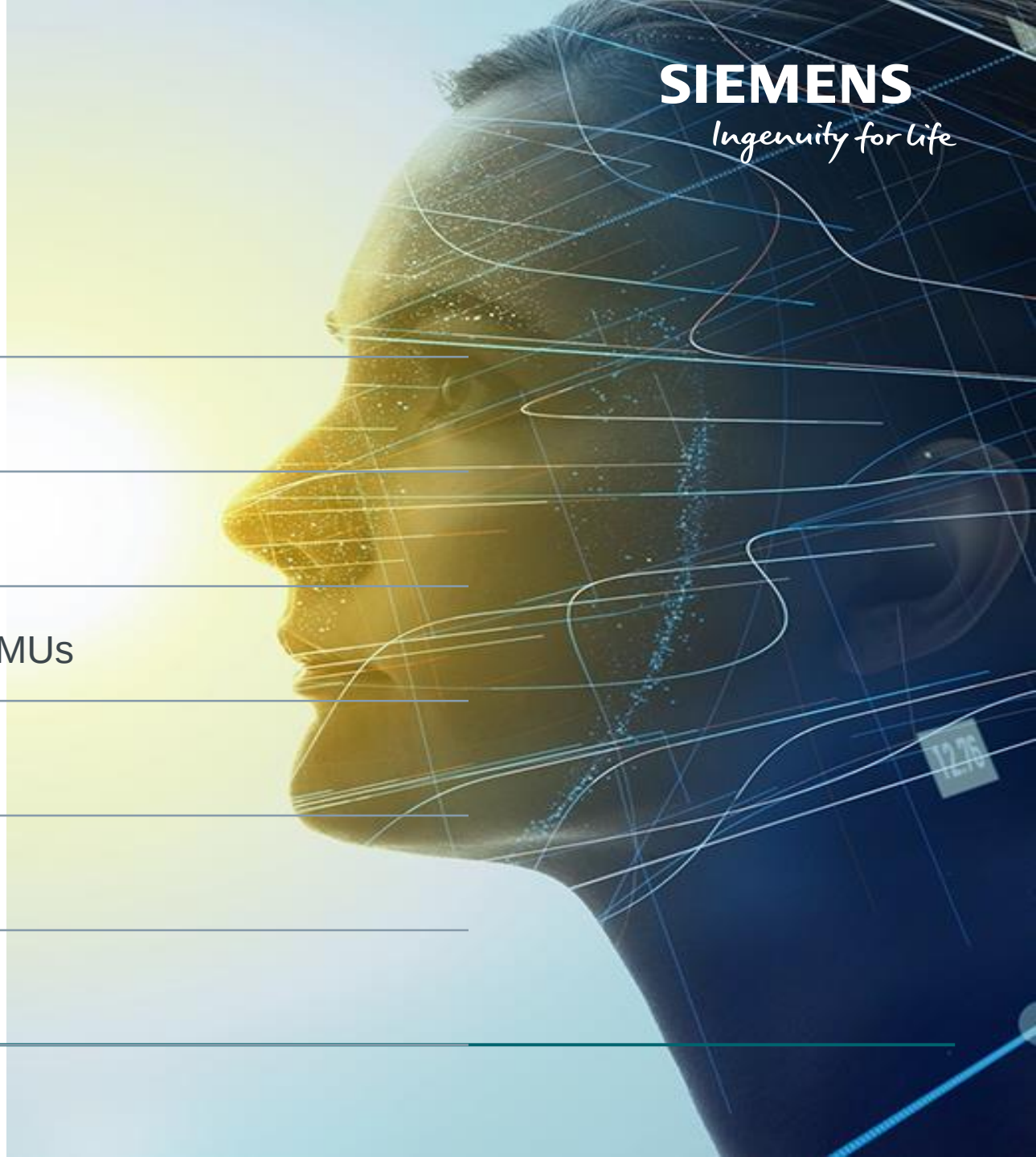




Easy and fast access to detailed communication status

Content



NEW: Measuring point disconnection functionality
Simplified maintenance, testing and operating

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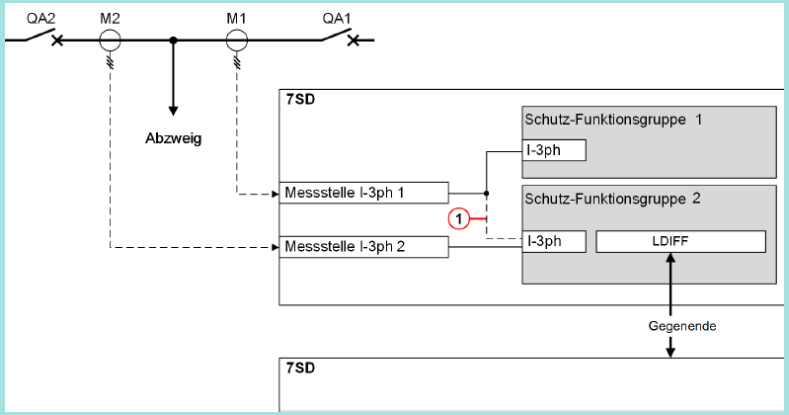
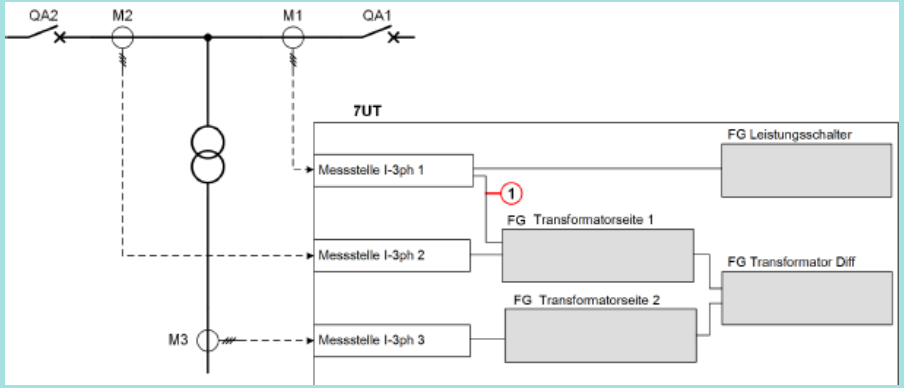
- Disconnection of individual 3ph current measuring points from the processing of the protection system
- No physical intervention on the terminals.
- Disconnection of the measuring point via binary input
- Avoids incorrect tripping of the connected protection function cause by current injection

- Higher availability of the whole protection system
- Cost efficient solution -> reduce number of devices
- Simplified engineering, maintenance, testing and operation

Line application example (1.5 circuit breaker scheme)



Transformer application example (1.5 circuit breaker scheme)



① Temporary disconnection of the measuring point I-3ph 1 to FG

NEW: Dynamic voltage regulation (DVR)

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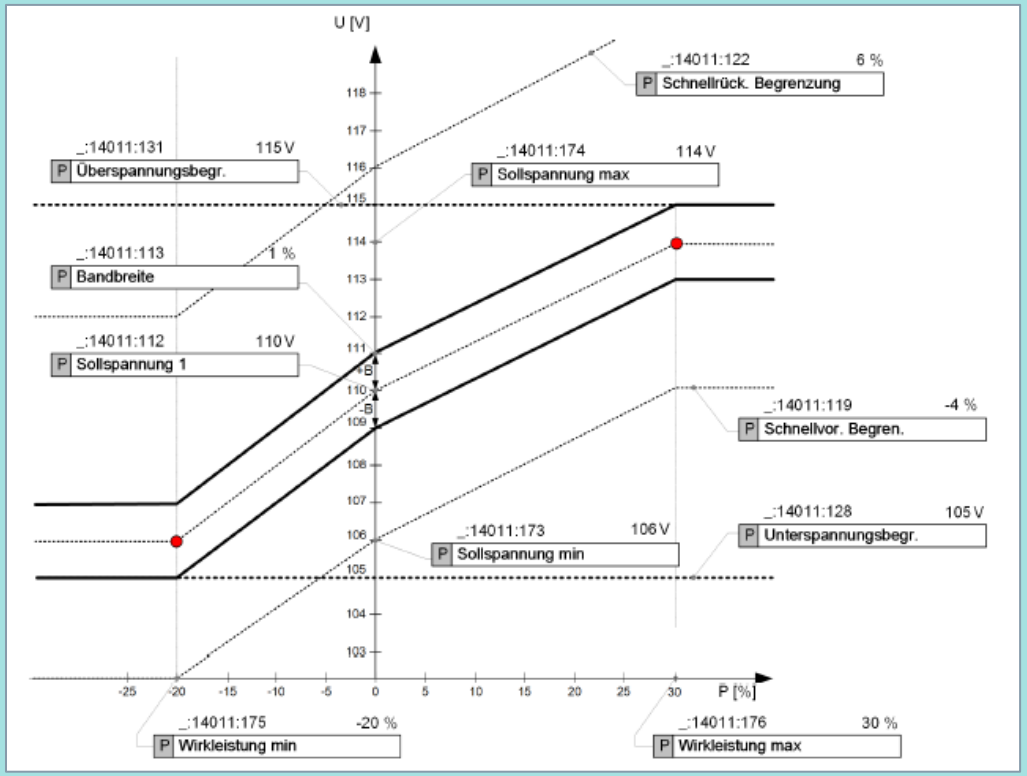
For increased infeeds and back-infeeds of renewable energy sources in the medium voltage, to keep the voltage in the specified range

- Bidirectional power flow by decentralized feeders
- Overvoltages in the individual nodal points caused by strong decentralized infeeds
- Voltage limits according to the power quality standard DIN EN 50160 can be exceeded
- Dynamic voltage regulation (DVR) adapts the voltage setpoint of the voltage regulator via a characteristic curve that depends on the direction of power flow over the transformer

Compliant voltage limits to the power quality standard DIN EN 50160 in case of strong renewable infeeds



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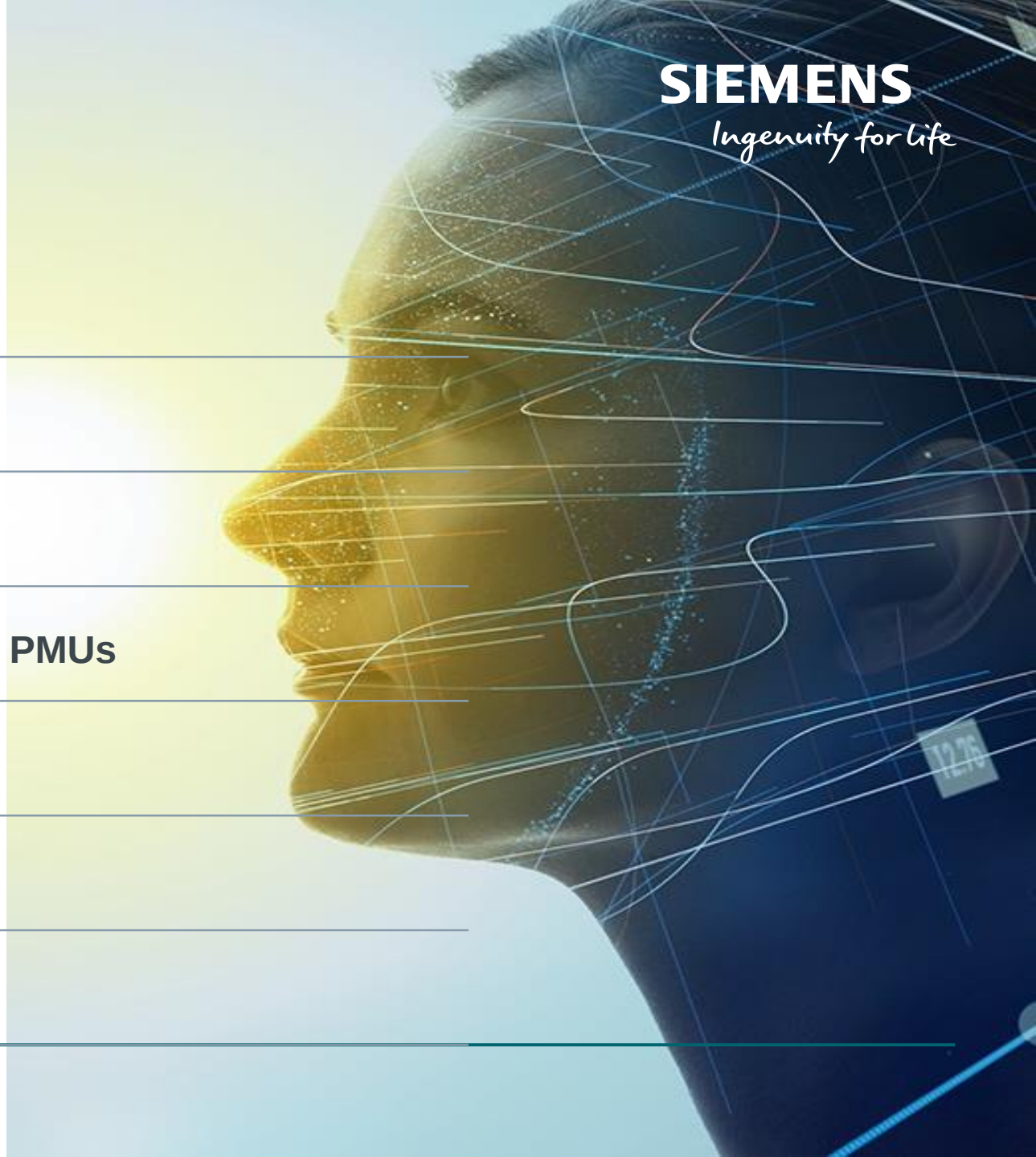

Retrofit of 3rd party PMUs with SIPROTEC 5 PMUs

Easy adaption of SIPROTEC PMUs to existing interface requirements

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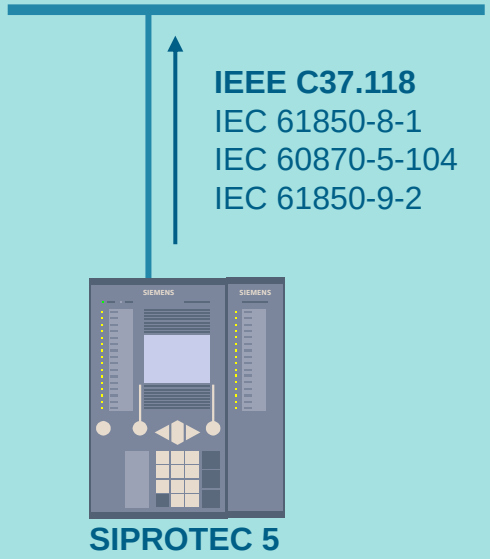
General PMU functionality

- **NEW:** Port configuration of PMU communication
- **NEW:** Transmit P,Q via IEEE C37.118
- **NEW:** Transmit phasor data and positive sequence together
- PMU multicast communication
- Transmit binary signal names via IEEE C37.11
- New config frame 3 fields

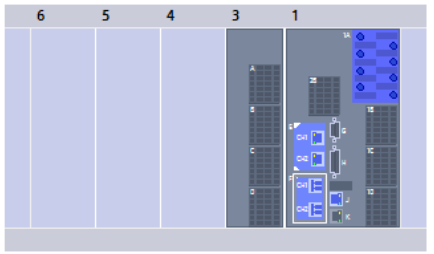


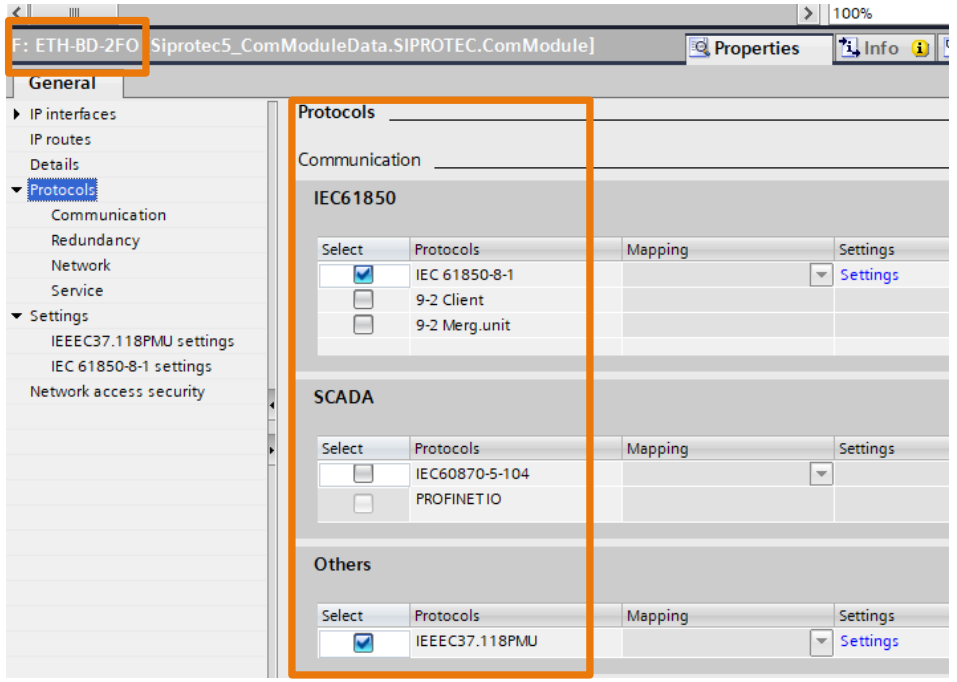
ETH-BD-2FO specific functionality

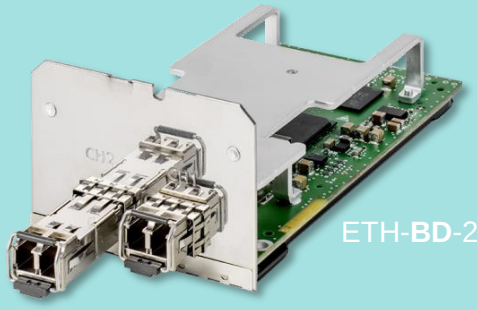
NEW: IEEE C37.118 PMU together with other communication protocols like IEC 61850-8-1, Profinet IO, IEC 60870-5-104, Process Bus Client, Merging Unit

NEW: Multiple Ethernet protocols on the same module
IEEE C37.118

- PMU protocol in parallel station bus protocols
- No additional Ethernet module for PMU functionality required
- Saves costs
- Segregation of protocols via VLAN possible







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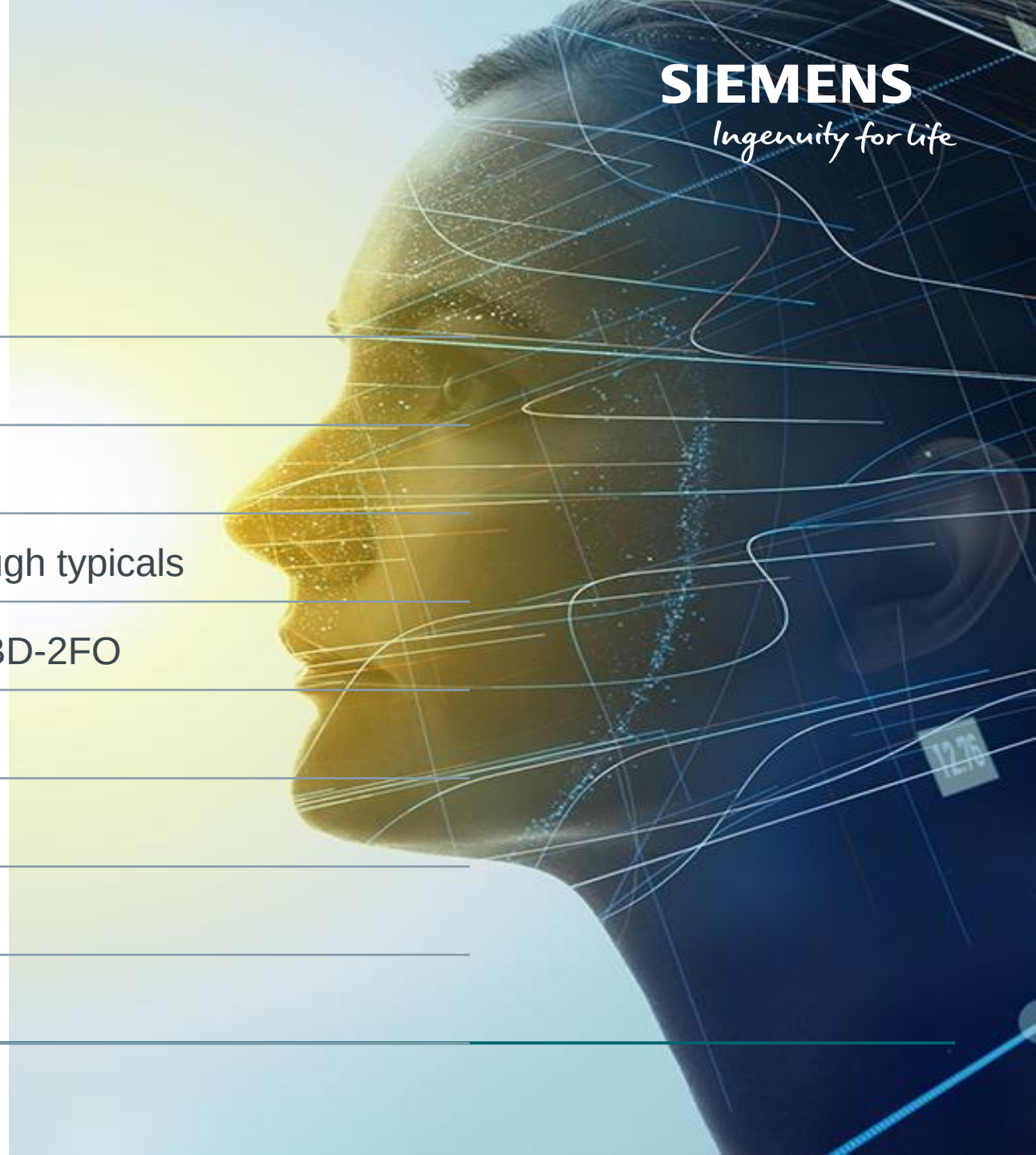
SIPROTEC 5

Designed to communicate

Release V08.30

siemens.com/processbus

Content



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Digital Substation
Process Bus Overview

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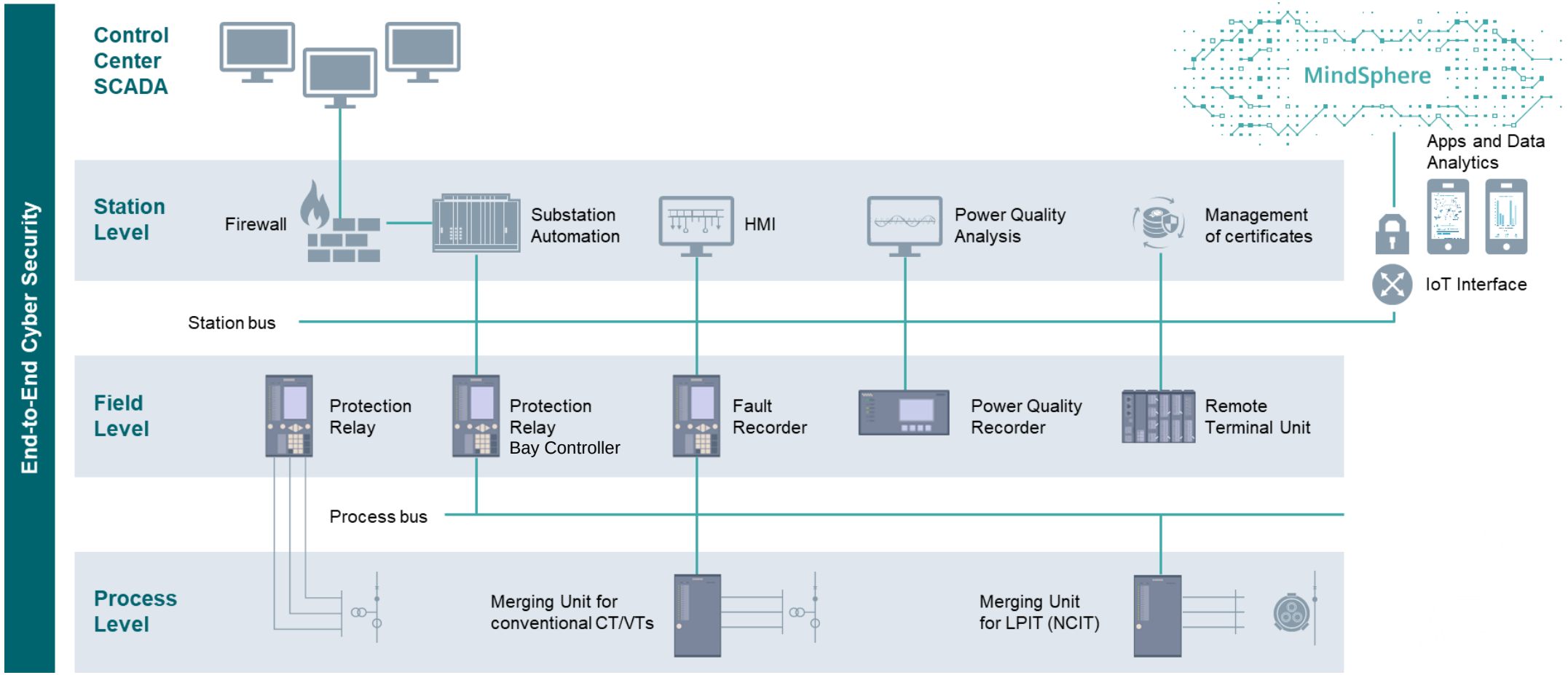

*for simplification the required IEEE 1588v2/PTP master clock is not shown

SIPROTEC 6MU85 and SIPROTEC 5 process bus client –
Digitalize your substation – Boost efficiency and reliability

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The SIPROTEC 6MU85 merging unit is the modular, interoperable and powerful solution between primary and secondary technology – versatile process data acquisition, autonomous automation and secure communication

Perfectly tailored fit

Modular functionality

- backup protection functions
- point on wave switching (PoW)
- Autonomous Automation
- Voltage regulation
- Tap changer controller
- synchronized commands

Modular hardware

- multiple CT, VT, LPIT inputs
- scalable BI and BO
- collection of additional data (temperature, pressure, tap changer positions, …)
- multiple mounting options
- expandable by a 2nd row
- optical SFP for up to 24 km

Designed to communicate

Process bus

- IEC 61850 Ed 2.1 compliant
- SMV streams IEC 61869-9, IEC 61850-9-2 and IEC 61850-9-2 LE

Sample and time synchronization

- IEEE 1588v2/PTP with enhanced stability against GNSS loss
- PPS, IRIG-B

SCADA

- IEC 61850-8-1, IEC 60870-5-104, Modbus IP, Profinet IO, DNP3, PMU

Network segregation

- physical with multiple interfaces
- virtual with VLAN

Communication redundancy

- PRP and HSR (for SCADA)

Safety and security Inside

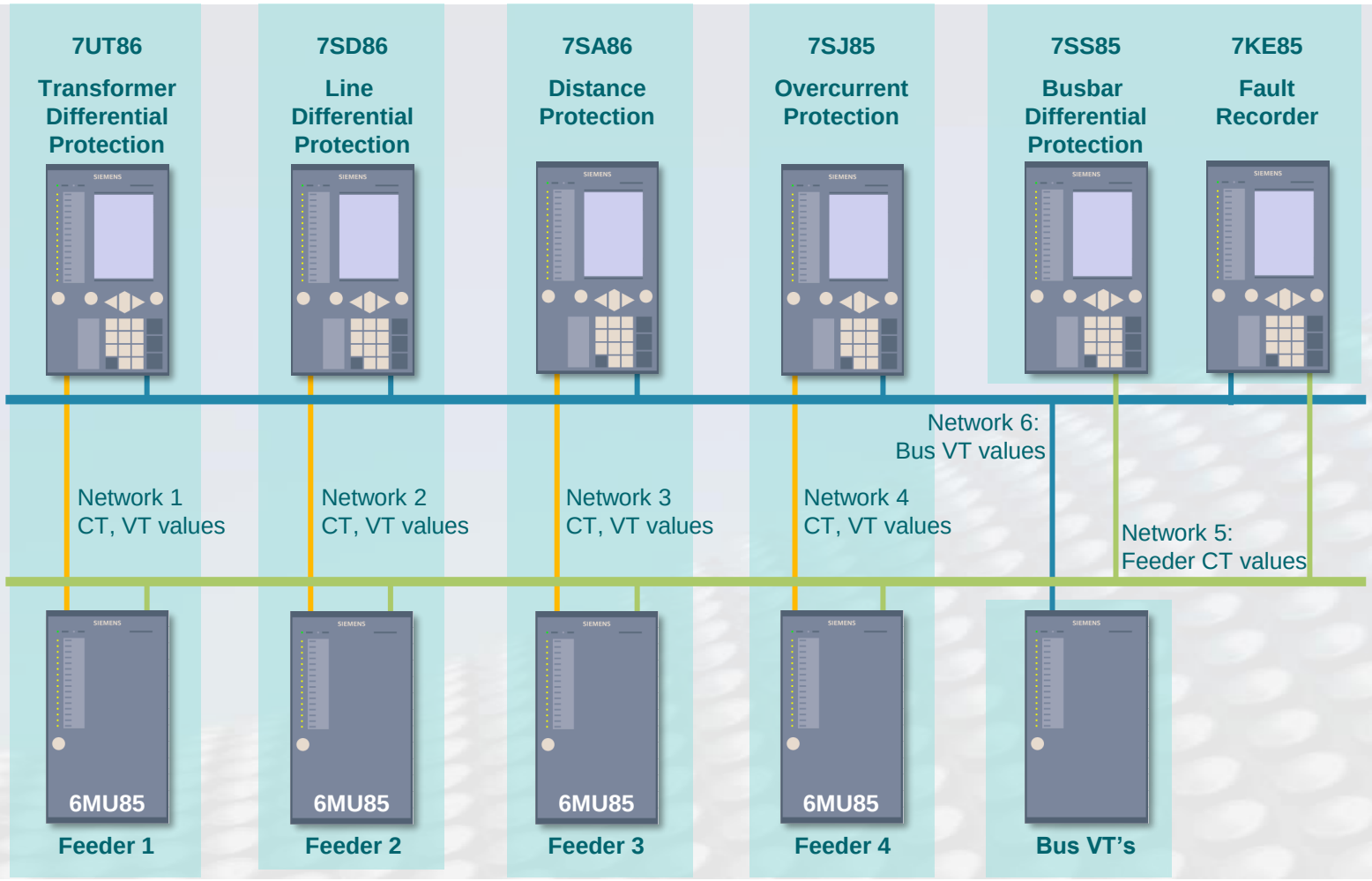
Hardware

- Ruggedized design and conformal coated electronical boards for high electric strength and installations in harsh environments - as standard
- high availability - redundant power supply

Embedded Cyber Security

- Secured communication with TLS/IPSec and client-server authentication
- firmware integrity checks
- ProductCERT for vulnerability handling
- Centralized account management and role-based access control
- Centralized security event logging
- Future readiness with PKI support

Network architectures
Physically network segregation



Simplify complexity

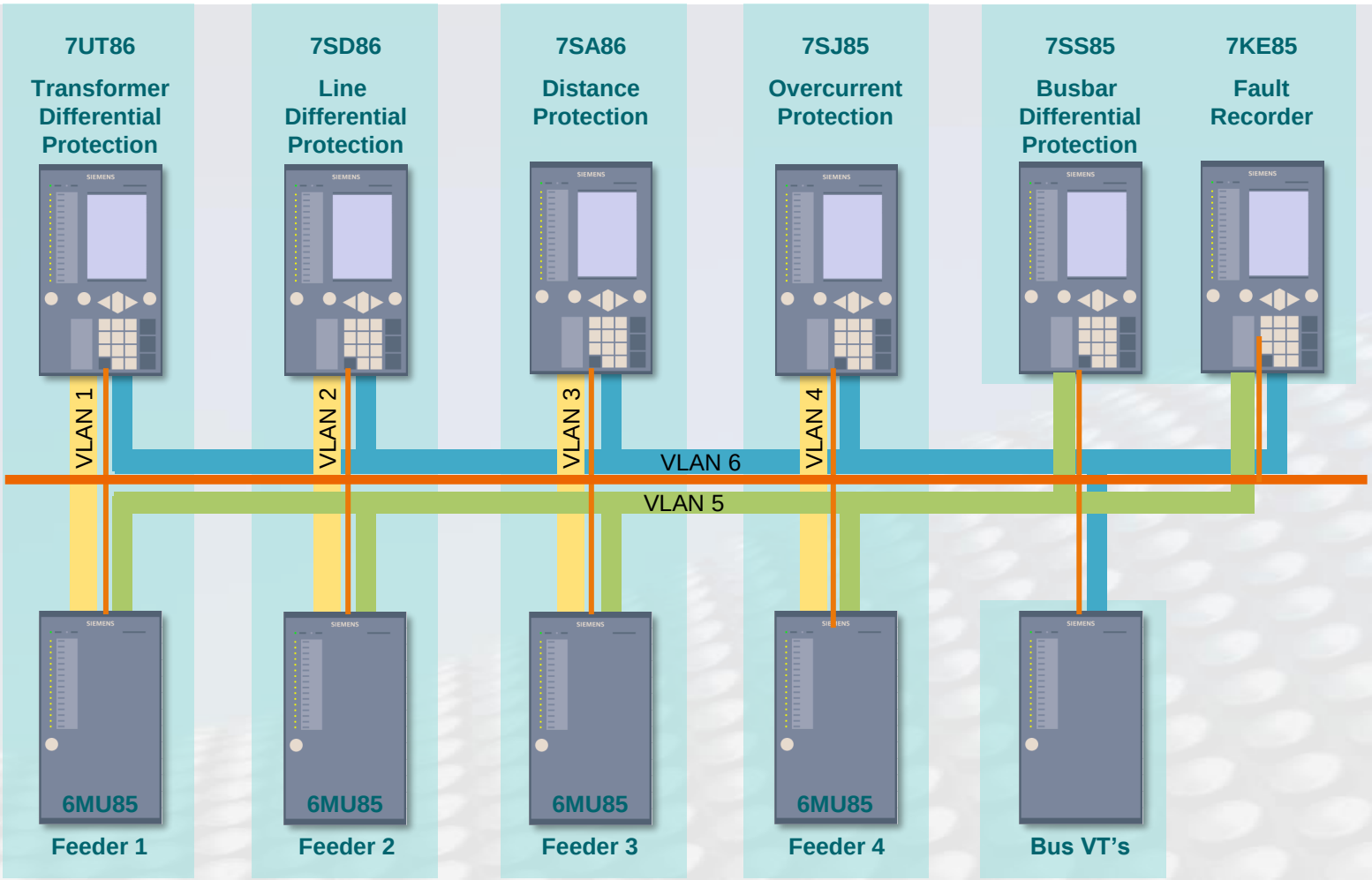
Use of more than one redundant process bus network reduces the network engineering

Increase the bandwidth with additional Ethernet interfaces

Efficient use of network bandwidth with customization of the analog values per SMV streams
(not only IEC 61850-9-2LE data set)

Note: Seamless networks redundancy recommended

Network architectures
Virtual network segregation (VLAN)



Simplify complexity

Segregation of one redundant process bus network into several virtual LANs reduces load and increases cyber security

One physical network reduces network costs

VLAN 1-4: CT, VT values for feeder protection

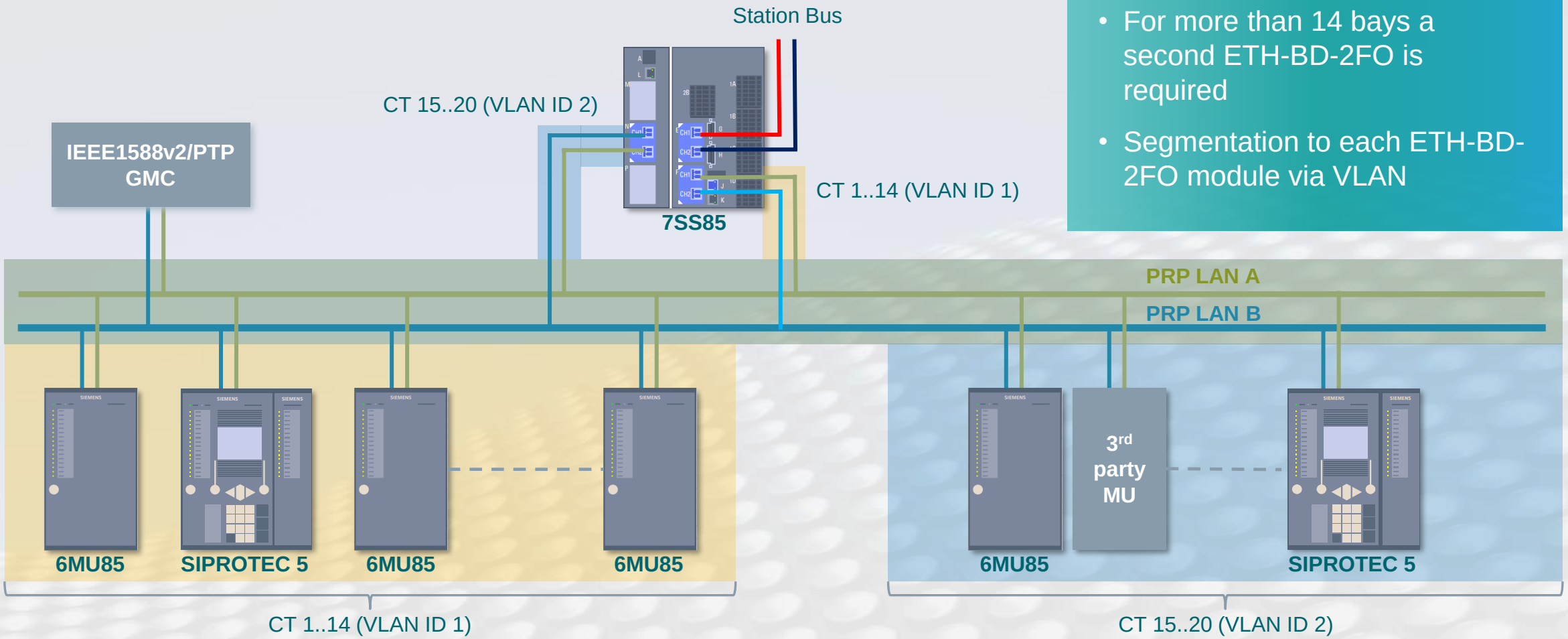
VLAN 5: Feeder CT values for busbar protection and fault recorder

VLAN 6: Bus VT for central fault recorder and feeder protection

Note: Seamless networks redundancy recommended

Network architectures

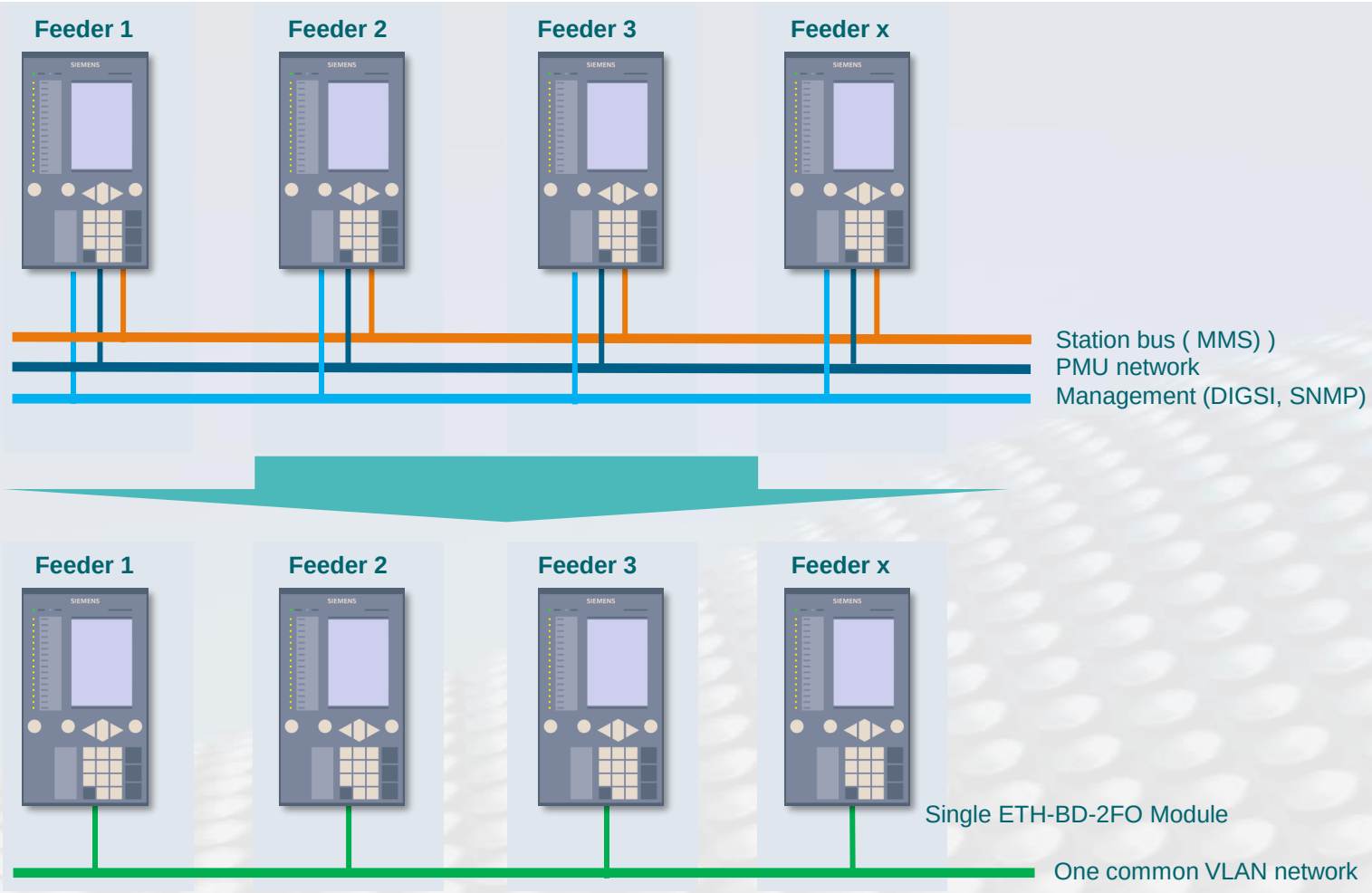
Example: VLAN for busbar protection with 20 bays



- For more than 14 bays a second ETH-BD-2FO is required
- Segmentation to each ETH-BD-2FO module via VLAN

Network architectures VLAN

Single ETH-BD-2FO module for all your communication



Simplify your network

- From 3 networks to 1 network
- Logical (VLAN) segregation of
  - Station bus
  - PMU network
  - Management network

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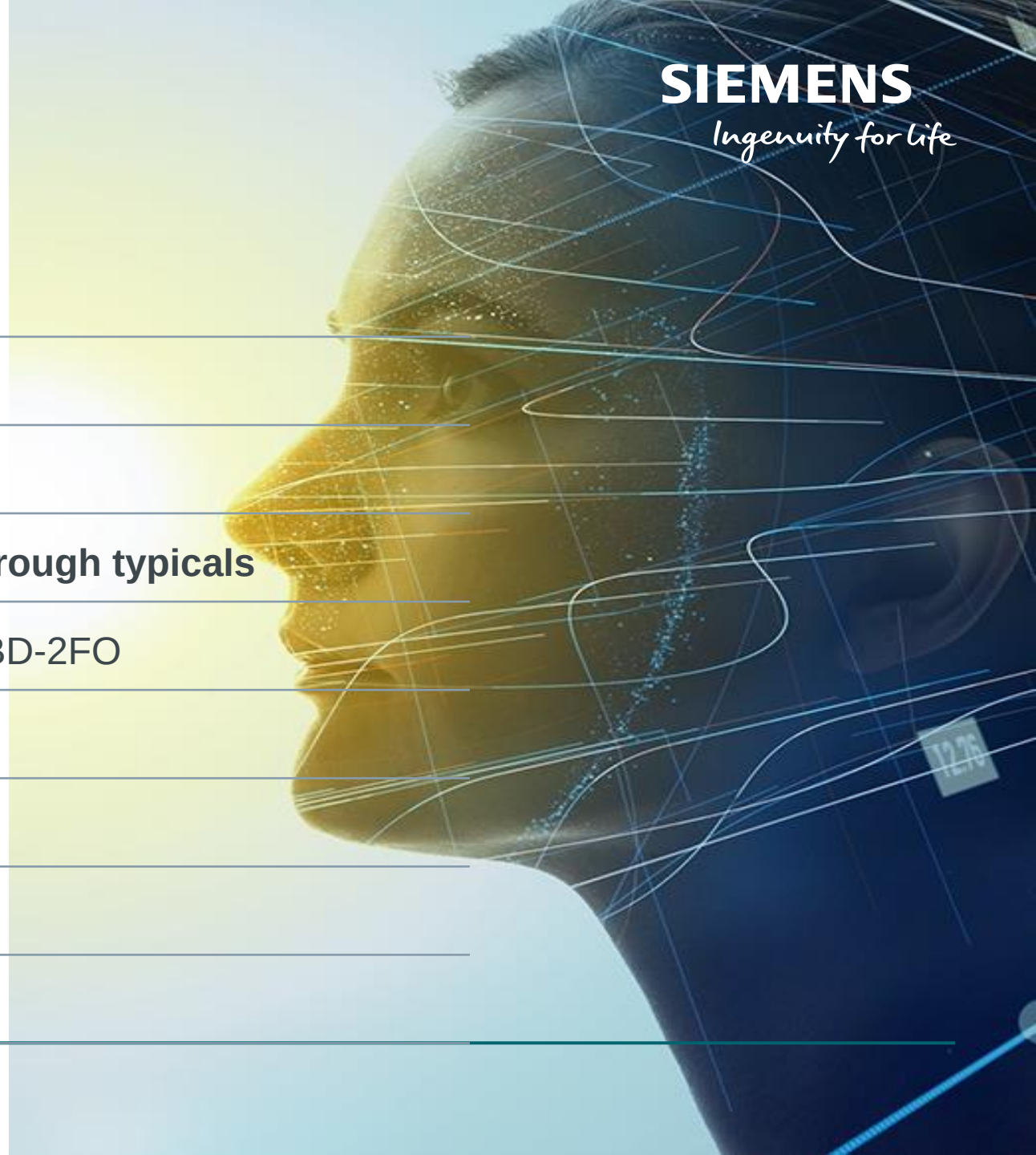

Designed to communicate
NEW: Automated IEC 61850 engineering with bay typicals

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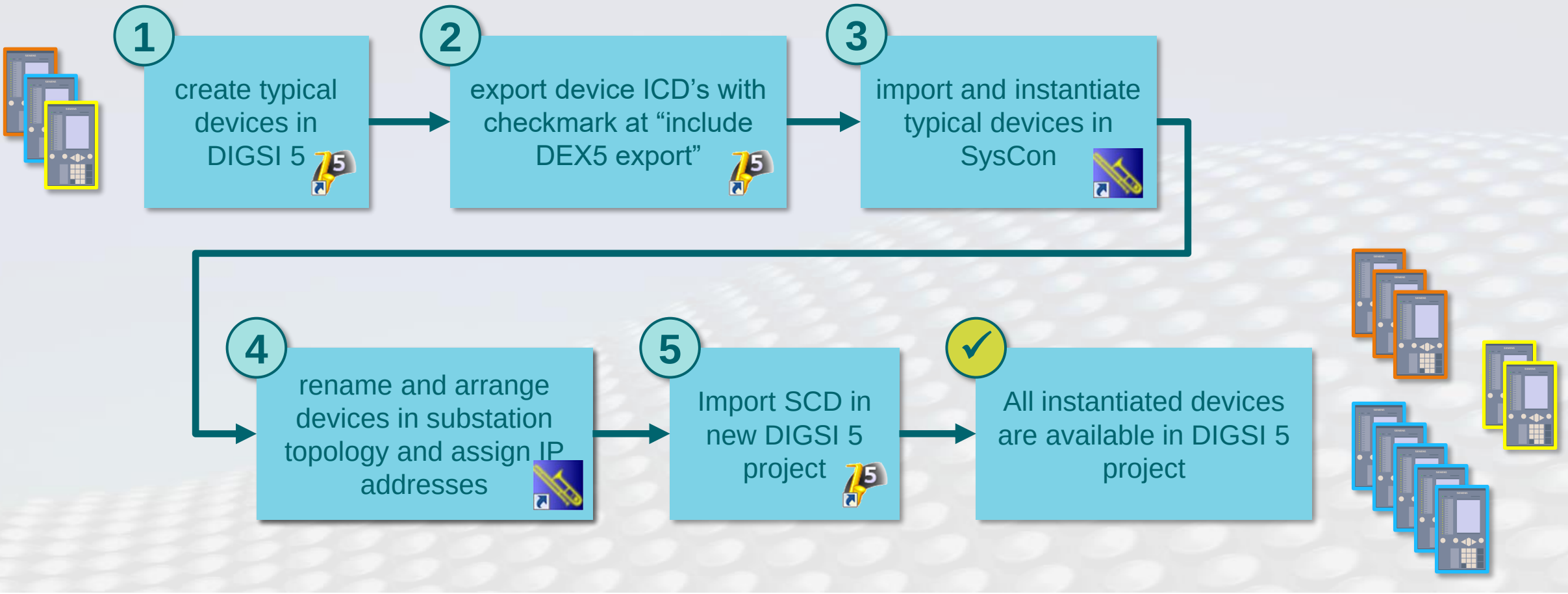

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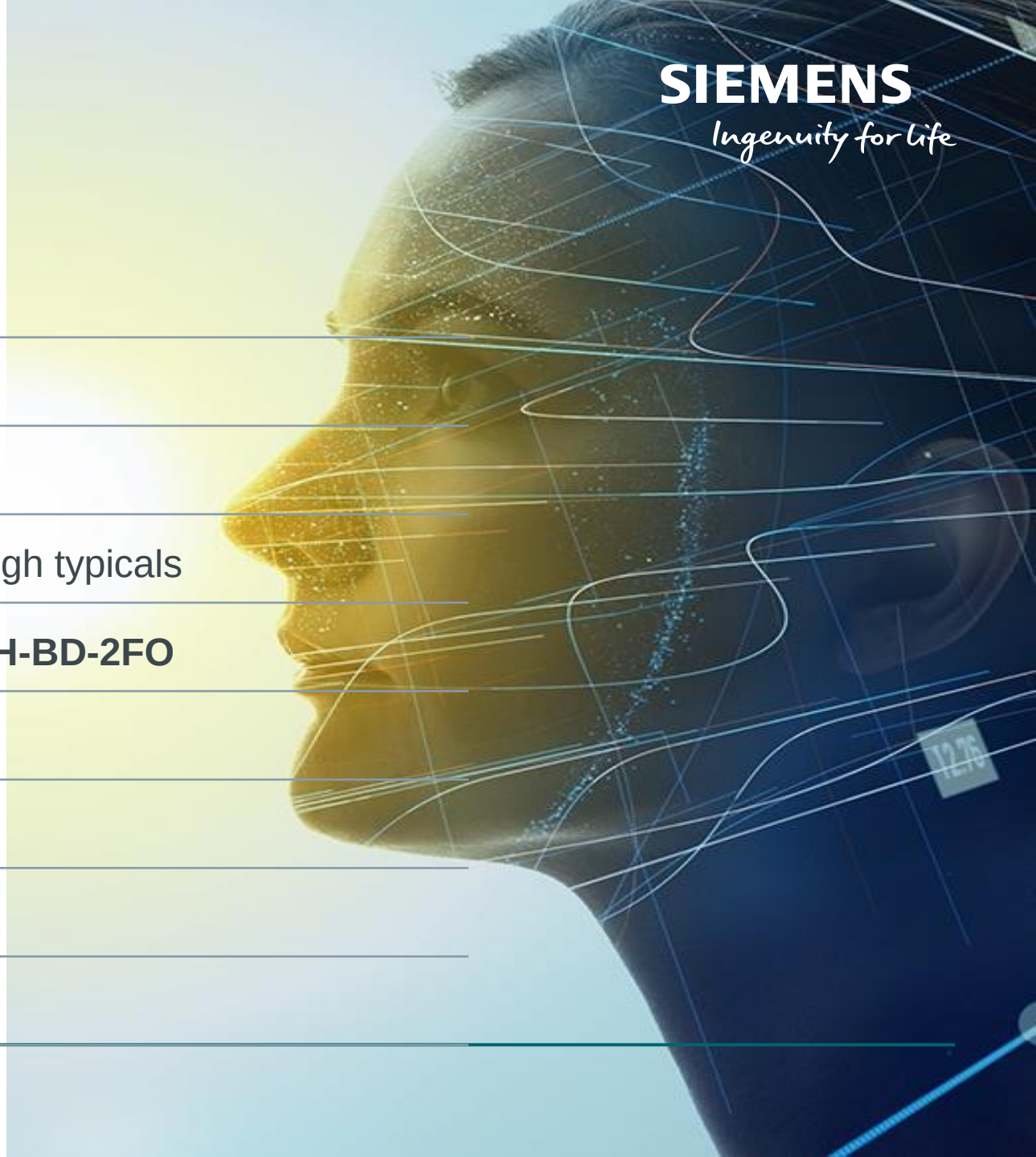

SIPROTEC 5
Plug-in Ethernet Communication Module ETH-BD-2FO

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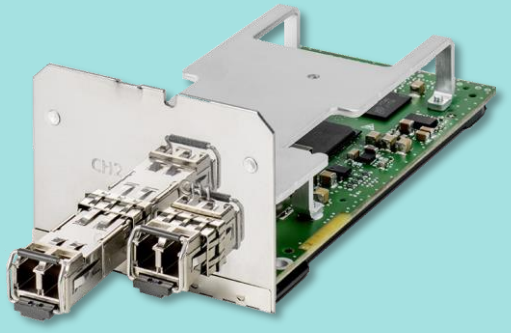
One Hardware, different functionalities (configurable per software):

- **IEEE 1588v2/PTP** → Allows the synchronization of the sampled values (1µs). The same signal can be used as absolute time reference for the device
- **Process Bus Server** → Merging unit functionality which enables the SIPROTEC 5 device to publish (send) sampled values. Using the DIGSI 5 is possible to define the standard/profile to be used (IEC 61850-9-2LE or IEC 61869-9)
- **Process Bus Client**→ Enables the SIPROTEC 5 device to subscribe (receive) sampled values
- **Station Bus** → IEC 61850-8-1 GOOSE/MMS
- **SCADA communication**
- **PMU**



SIPROTEC 5
New Ethernet module – ETH-BD-2FO

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Communication module for the transmission of Ethernet protocols via 2 optical interfaces

NEW: Additional protocols (Device DDD V8.30)

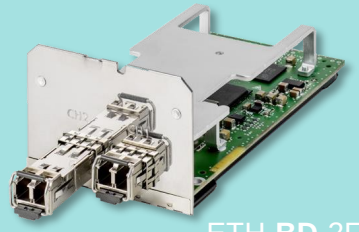
- HSR (no IEEE 1588v2/PTP support)
- IEEE C37.118 (PMU)
- Profinet IO incl. S2 redundancy
- IEEE 1588v2/PTP support C37.238:2017 profile

Available protocols (Device DDD V8.03)

- PRP, Line Mode, RSTP
- IEC 61850-8-1 GOOSE, MMS
- IEC 60870-5-104
- SNTP
- COMFEDE support via MMS file transfer
- IEEE 1588v2/PTP (1µs accuracy) ordinary slave clock for radial networks (PRP and Line Mode) – IEC 61850-9-3 profile
- DIGSI 5 protocol
- DCP
- DHCP
- Homepage
- WebUI
- SysLog
- RADIUS
- IEC 61850-9-2 Process Bus Client
- IEC 61850-9-2 Merging Unit

Technical Specification:

Connector type	2 x duplex LC
Wavelength	λ = 1300 nm
Baud rate	100 Mbit/s
Max. line length	2 km for 62.5 µm/125 µm optical fibers



ETH-**BD**-2FO

Transmit Power	Minimum	Typical	Maximum
50 µm/125 µm, NA1 = 0.2	-24.0 dBm	-21.0 dBm	-17.0 dBm
62.5 µm/125 µm, NA1 = 0.275	-20.0 dBm	-17.0 dBm	-14.0 dBm

Receiver sensitivity	Maximum -12.0 dBm Minimum -31.0 dBm
Optical budget	Minimum 7.0 dB for 50 µm/125 µm, NA1 = 0.2 Minimum 11.0 dB for 62.5 µm/125 µm, NA1 = 0. 275
Interface design	Corresponds to IEEE 802.3, 100Base-FX
Laser class 1 as per EN 60825-1/-2	With the use of 62.5 µm/125 µm and 50 µm/125 µm optical fibers

Comment: 1 Numerical Aperture (NA = sin θ (launch angle))

Designed to communicate Profinet IO with S2 Redundancy

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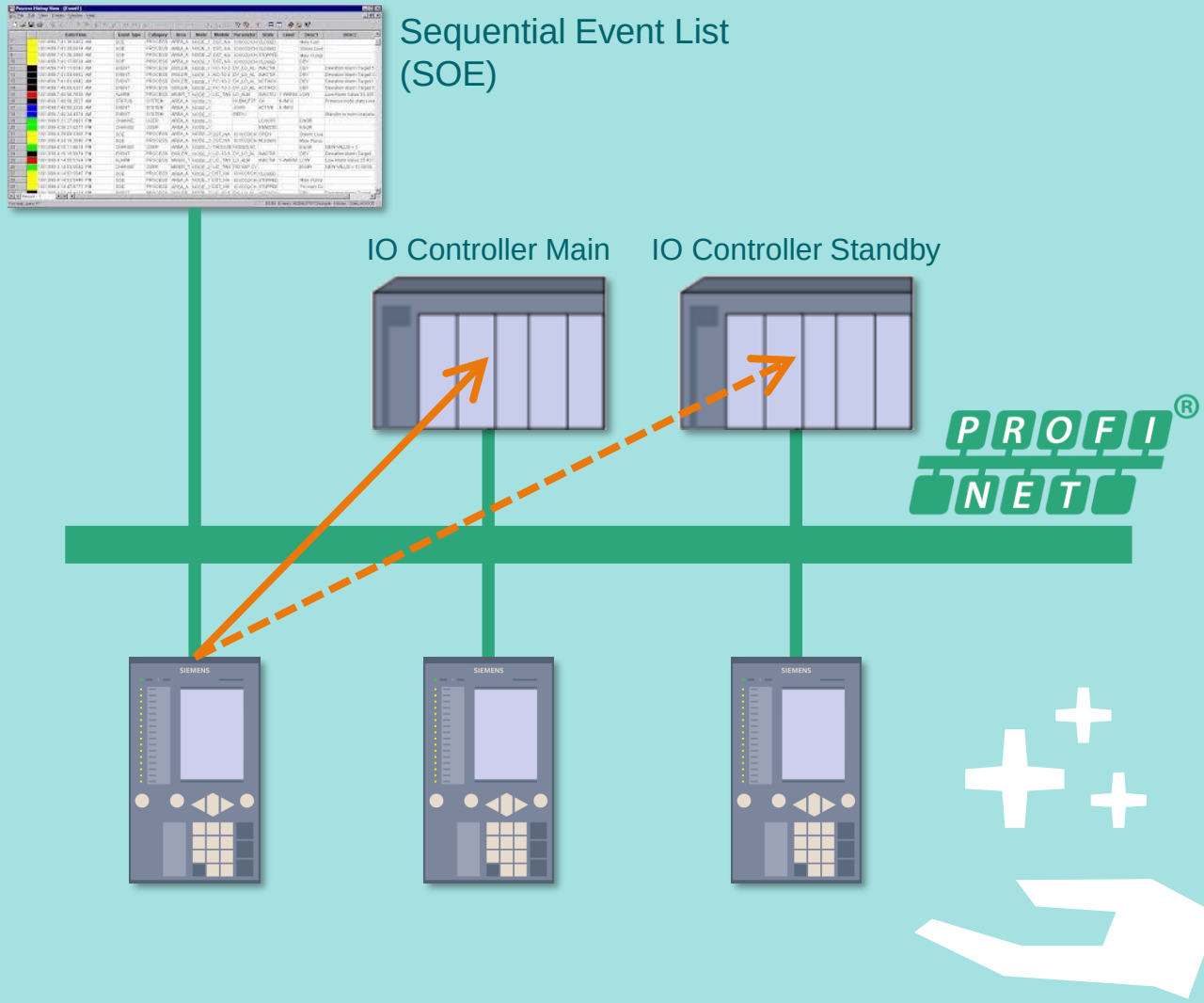
NEW:* Profinet IO on **ETH-BD-2FO**

NEW:* High availability connection of SIPROTEC 5 as an IO device to two redundant Profinet IO Controllers

NEW:* Sequence of Events log from the SIPROTEC 5 IO device to enable monitoring of Process data from your factory

Effortless integration into existing Profinet IO networks with optional RJ-45 SFP

*ETH-BD-2FO plug-in module is required



SIPROTEC 6MU85
Enhancement of streams

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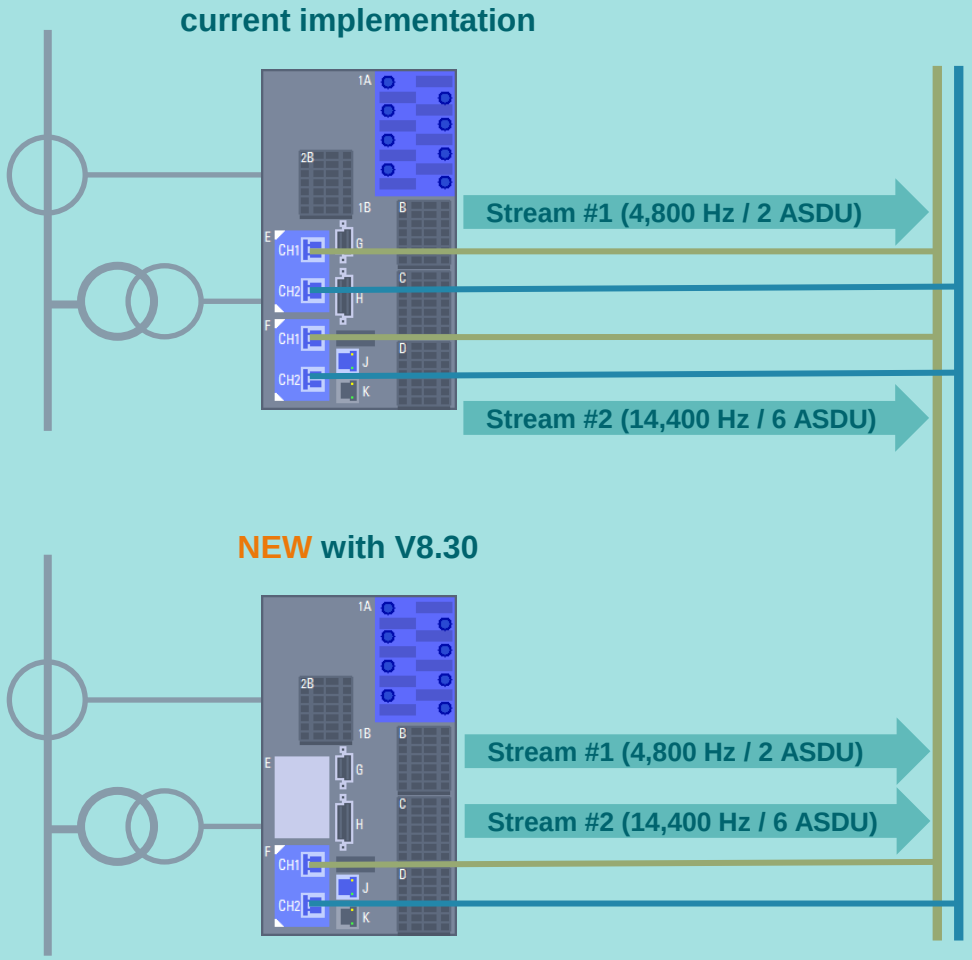
NEW Publishing of 2 sampled value streams

With the capability of publishing two sampled value streams from the same ETH-BD-2FO module

- Reduction of required ETH-BD-2FO for same amount of sampled value streams
  → **reduction of HW cost**
- Reduction of required network ports for process bus network
  → **reduction of network cost**
- Merging Unit functionality is compensated via function points per instance activated at ETH-BD-2FO
  → **reduction of FP cost**

NEW Start publishing of sampled values without an available sample synchronization.

The merging unit will start publishing sampled value streams without a existing or established sample synchronization. Sampled value streams will be marked as not synchronized.



New sampling rate for Merging Unit and Process Bus Client

IEC 61869-9 , IEC 61850-9-2 and 9-2 LE

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Digital output samples rates kHz	Numbers of ASDUs per frame	Remarks	Preferred Applications
4,00	1	For use on 50 Hz backward compatible with 9-2LE guideline	Protection Fault Recording
4,80	1	For use on 60 Hz systems backward compatible with 9-2LE guideline, or 50 Hz systems backward compatible with 96 samples per nominal system frequency cycle [1]	Protection Fault Recording
4,80	2	Preferred rate for general measuring and protective applications, regardless of the power system frequency [2, 3]	Protection Fault Recording
12,80	8	Outdated, only for use on 50 Hz systems	Power Quality Fault Recording
NEW 14,40	6	Preferred for quality metering applications, regardless of the power system frequency. [2]	Power Quality Fault Recording
15,36	8	Outdated, only for use on 60 Hz systems	Power Quality Fault Recording

1 Recommendation by Siemens – more fault tolerant | **2** Recommended by standard | **3** Preferred for distributed BBP

Siemens Implementation

- Support of IEC 61869-9 sampling rates
- Backward compatible to IEC 61850-9-2 LE
- More fault tolerant: 4,80 kHz and 1 ASDU per frame can be used for protection (9-2 LE)
- Missing of one sample will be interpolated

Optional SFP for the ETH-BD-2FO
as replacement of standard multimode SFP for 2 km

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Optical SFP for up to 24 km	
Order Code	P1Z3210 (pack of 10 units)
Connector type	2 x duplex LC
Wavelength	λ = 1300 nm
Baud rate	100 Mbit/s
Protocol	See ETH-BD-2FO
Max. line length	24 km for 9 µm/125 µm optical fibers

Electrical SFP for up to 20 m (not for sample synchronization)	
Order Code	P1Z3201 (pack of 10 units)
Connector type	RJ45
Baud rate	100 Mbit/s
Protocol	See ETH-BD-2FO
Max. line length	20 m with Ethernet patch cable CAT 6 S/FTP, F/FTP, or SF/FTP
Interface design	Corresponds to IEEE 802.3, 100Base-TX

Sample synchronization vs. time synchronization

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Sample Synchronization

- **Relative reference** used to align or synchronize several signals among each other
- It can be provided by a pulse or by a time signal
- **Used to synchronize the sampled values (1µs)**

Time Synchronization

- Universal time reference signal, provided by a master clock
- **Absolute time** stamp which contains exact date and time
- **Used for data fault analysis (1ms)**

Synch. Method	Distribution	Typical Accuracy	Synchronization Application
IRIG-B	Separate wiring	10µs – 1ms	Time Synchronization
1 PPS	Separate wiring	<1µs	Sample Synchronization
NTP	Network	1ms – 10ms	Time Synchronization
IEEE 1588 PTP	Network	<1µs	Time and Sample Synchronization

* Some IRIG-B telegrams contain the PPS pulse and can be used for SV synch. as well

Sample and time synchronization
Precision Time Protocol – IEEE 1588v2/PTP

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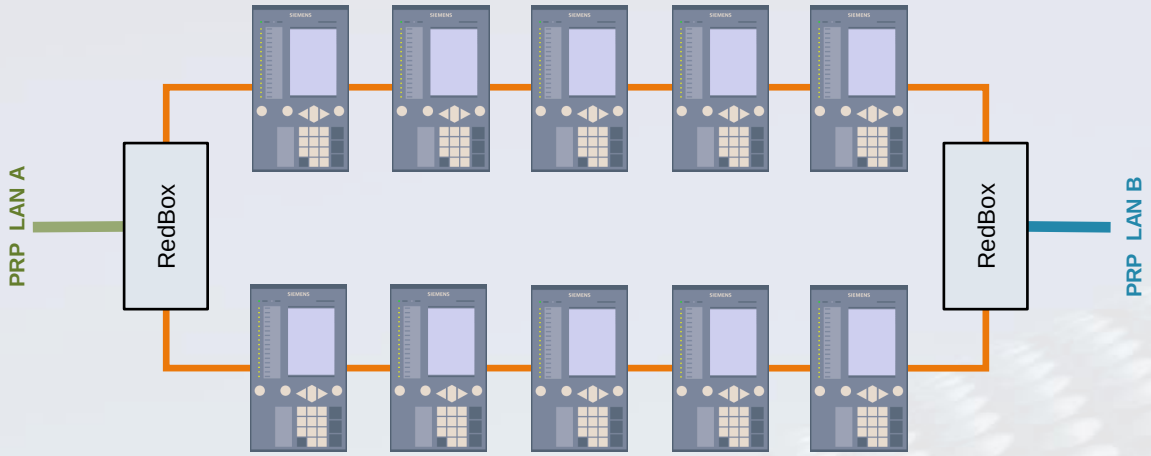
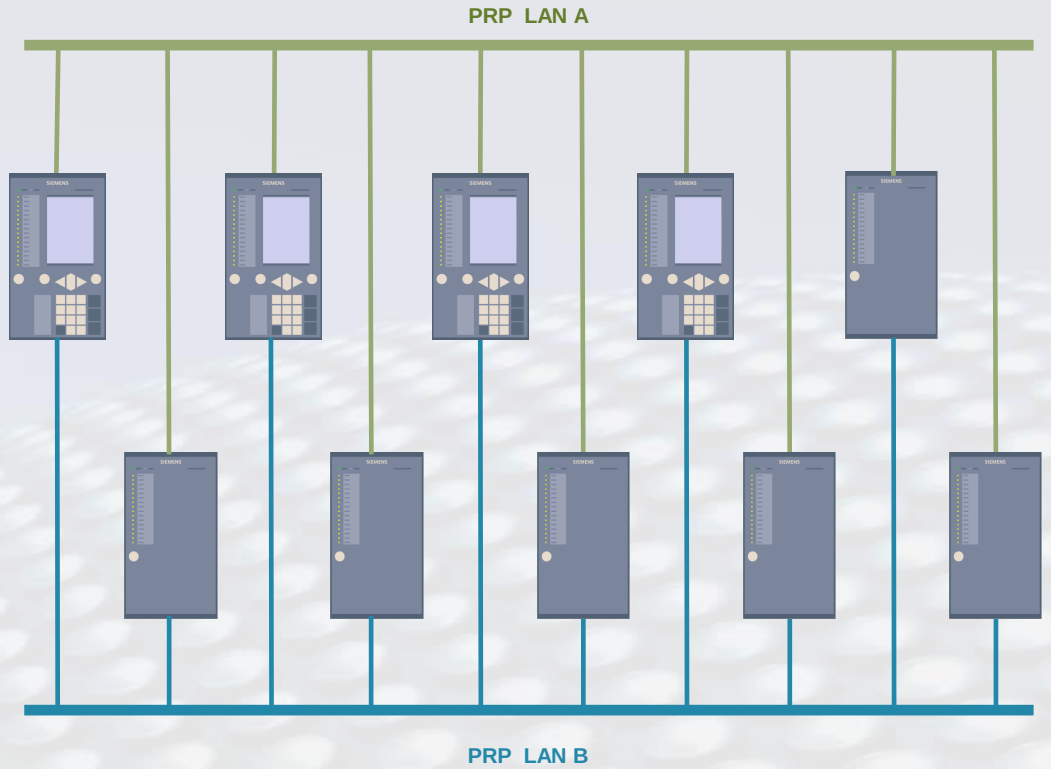
	Sample and time synchronization	Time synchronization
Communication Plug-In Module	**ETH-BD-2FO**	ETH-BA-2EL ETH-BB-2FO
Applications	• Date and time synchronization • Sample synchronization for process bus • PMU data synchronization • 87L stabilization for unsymmetrical PI networks	• Date and time synchronization
Type of implementation	Hardware / FPGA	Software
Accuracy	1 µs [1)]	1 ms
Supported devices	Modular SIPROTEC 5 devices 7xx85/86/87 (except 7ST85)	All SIPROTEC 5 devices
Supported Redundancy	PRP Line Mode	PRP (symmetrical) [2)] Line Mode
Supported Profiles	IEC 61850-9-3 (Power Utility Automation Profile) **NEW:** IEEE C37.238:2017 (Power System Application Profile) [2)]	
Clock Type	Ordinary Slave Clock (OSC)	Ordinary Slave Clock (OSC)

[1)] with optional accessory RJ45 SFP module accuracy will be 1ms
[2)] PRP LAN A and PRP LAN B needs to be identical, to ensure the same number of hops to be passed from the PTP telegrams

Designed to communicate
HSR and PRP redundancy



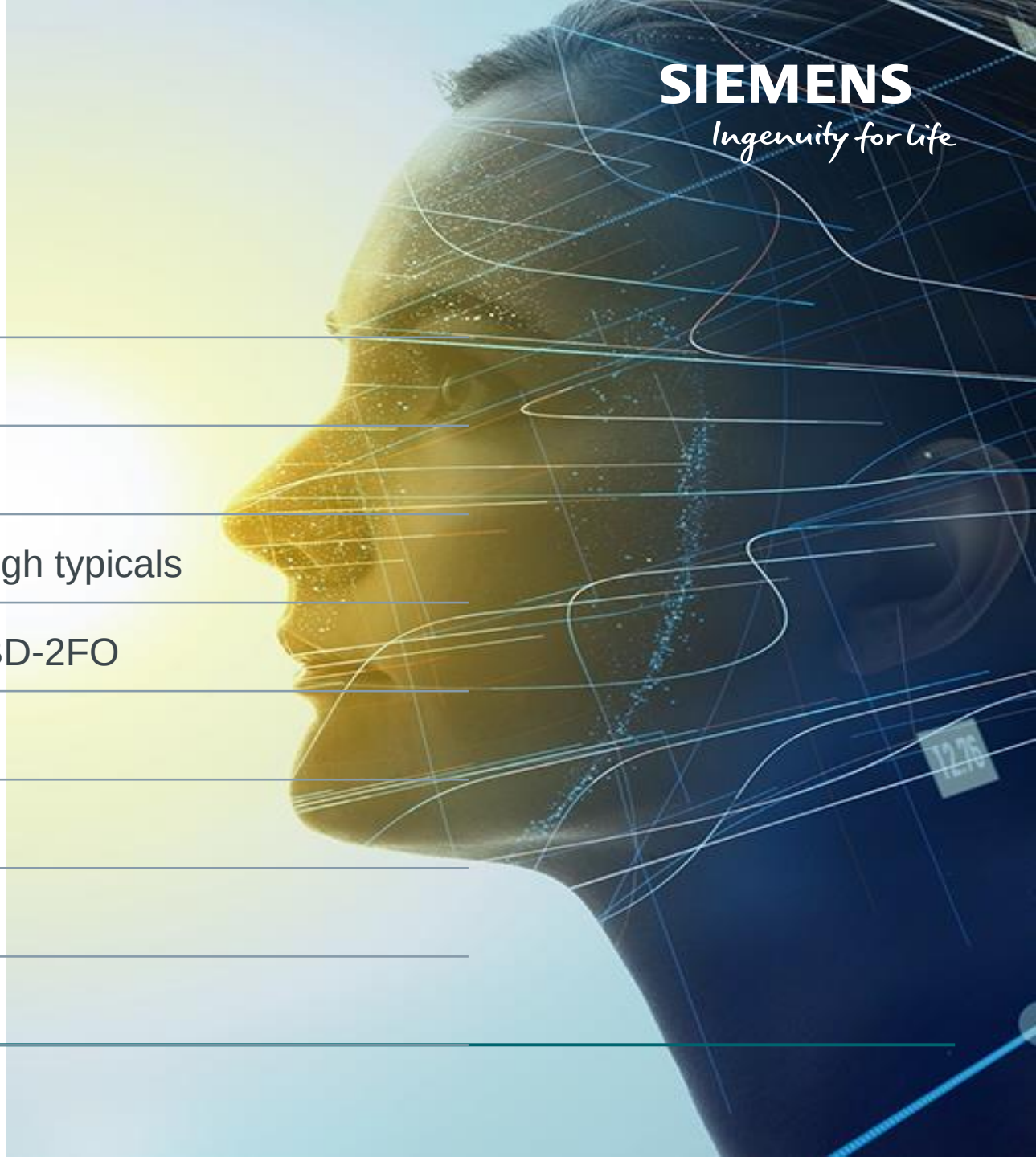
New on ETH-BD-2FO module:
HSR* ring with clients and server connected to PRP LANs



PRP redundancy with clients and server for station and process bus

* Support of IEEE 1588v2/PTP (transparent clock) in preparation

Content



Retrofit of 3rd party PMUs with SIPROTEC 5 PMUs

Easy adaption of SIPROTEC PMUs to existing interface requirements

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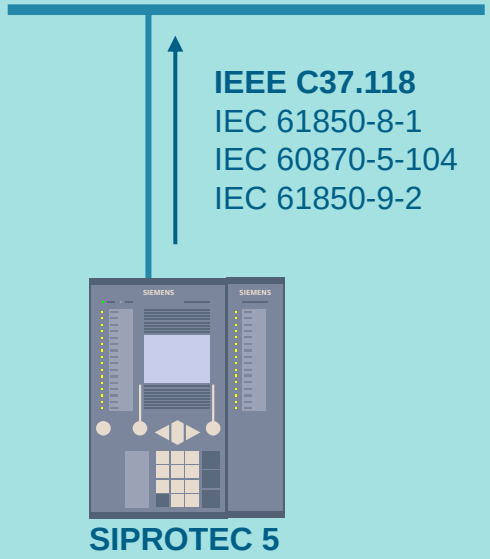
General PMU functionality

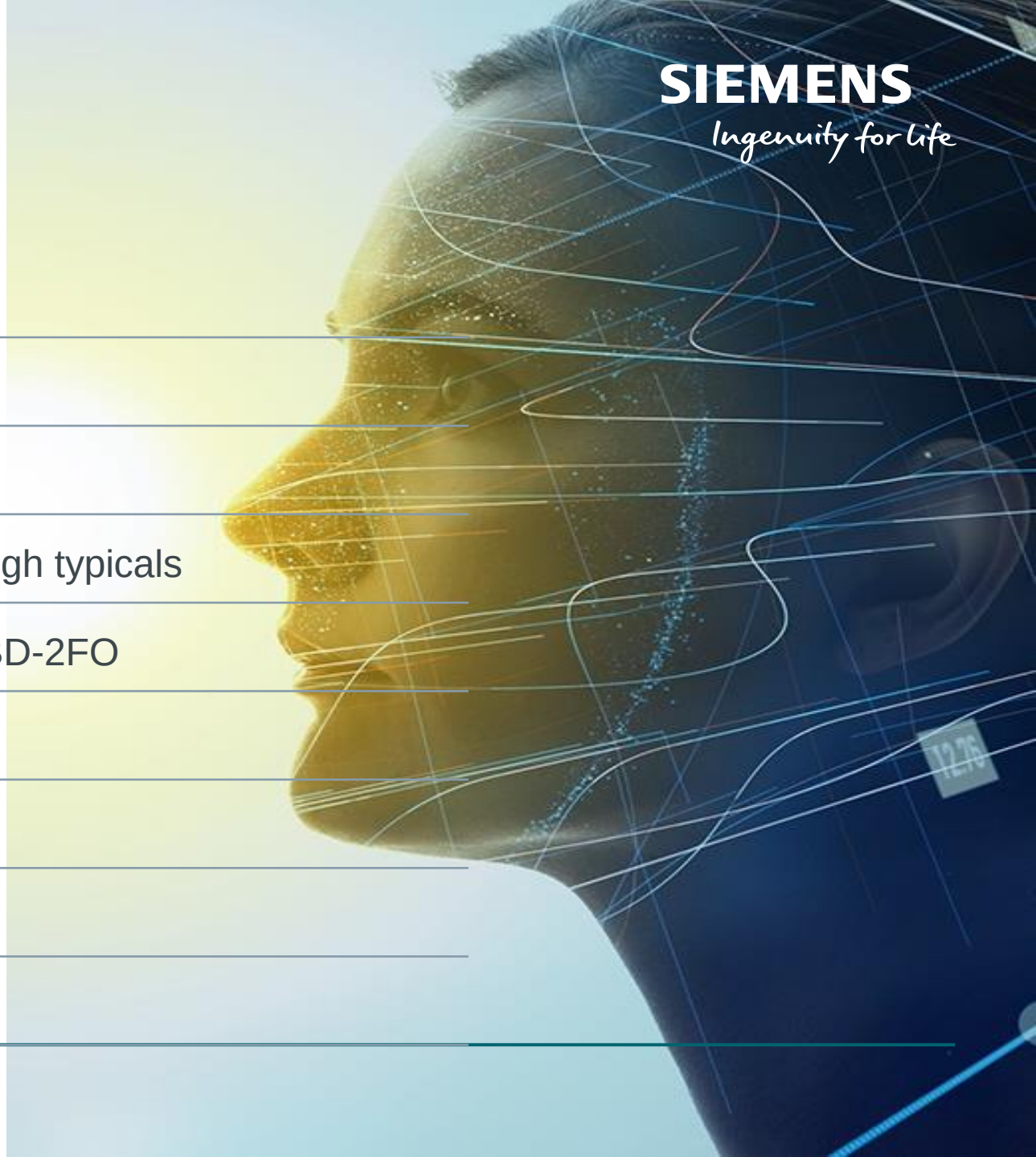
- **NEW:** Port configuration of PMU communication
- **NEW:** Transmit P,Q via IEEE C37.118
- **NEW:** Transmit phasor data and positive sequence together
- PMU multicast communication
- Transmit binary signal names via IEEE C37.11
- New config frame 3 fields



ETH-BD-2FO specific functionality

NEW: IEEE C37.118 PMU together with other communication protocols like IEC 61850-8-1, Profinet IO, IEC 60870-5-104, Process Bus Client, Merging Unit

Content



Designed to communicate
Pulse per Second Input

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Ingenuity for life

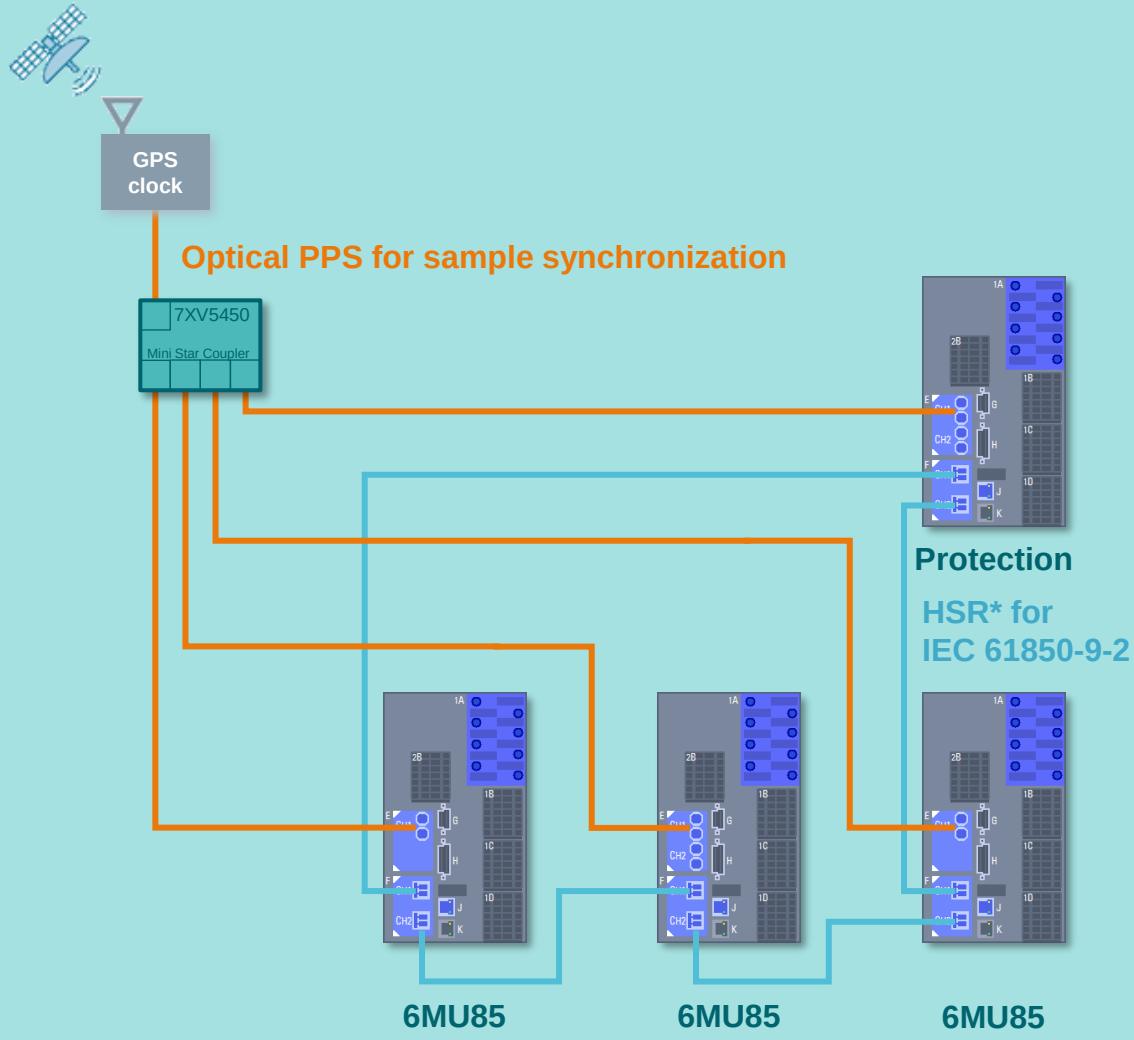
NEW Optical Pulse per Second input

A optical pulse per second can be connected to the USART-AD-1FO and USART-AE-2FO serial communication plug-in module.

- Sample synchronization for IEC 61850-9-2
  Small process bus installations benefit from a cost effective way to synchronize samples
  → reduction of network equipment
- Stabilization of 87L in case of unsymmetrical communication network
  → simplification of PPS distribution

NEW Electrical Pulse per Second or IRIG-B for IEC 61850-9-2 sample synchronization

The sample synchronization of a merging unit or process bus client can be realized with a electrical pulse per second or IRIG-B signal connected to Port G of the SIPROTEC 5 device.



* max. 5 devices in HSR Ring for IEC 61850-9-2

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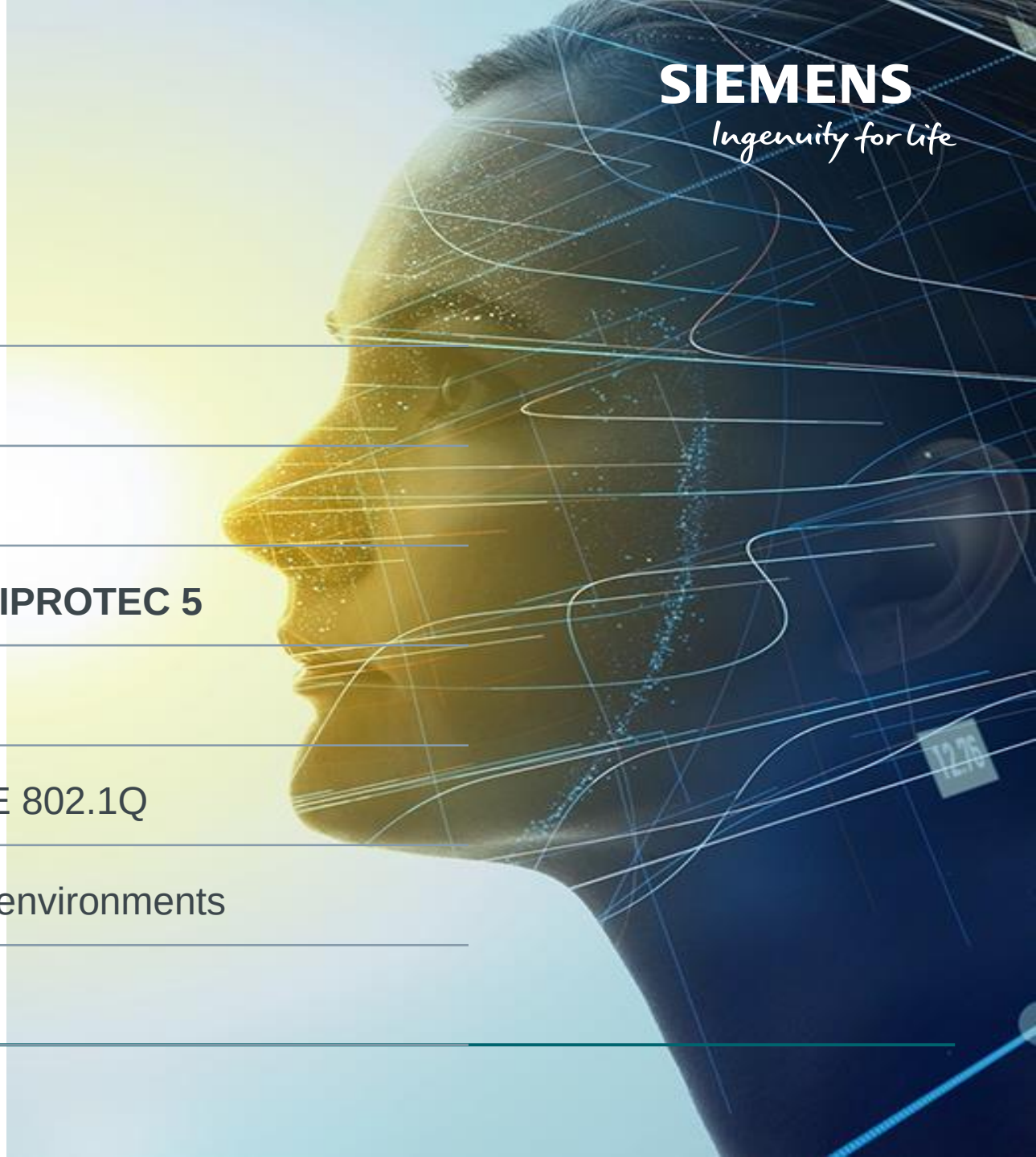
SIPROTEC 5

Strong in Safety and Security

Release V08.30

siemens.com/gridsecurity

Content



Integrated cyber security

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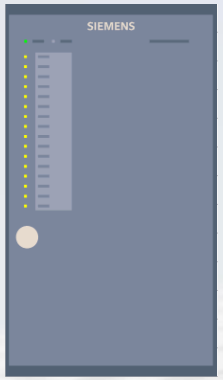
Trusted Partner

Product Security

System Security

Operational Security



Features

- Customer-authorized DIGSI 5 Instances
- Role-based Access Control
- Authenticated network access for COM-Modules
- Use of customer certificates
- Recording of security-relevant events and alarms
- Confirmation codes for safety-critical operations
- Crypto-chip for secure information storage
- Siemens CERT and Patch management

Integrated cyber security

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Ingenuity for life

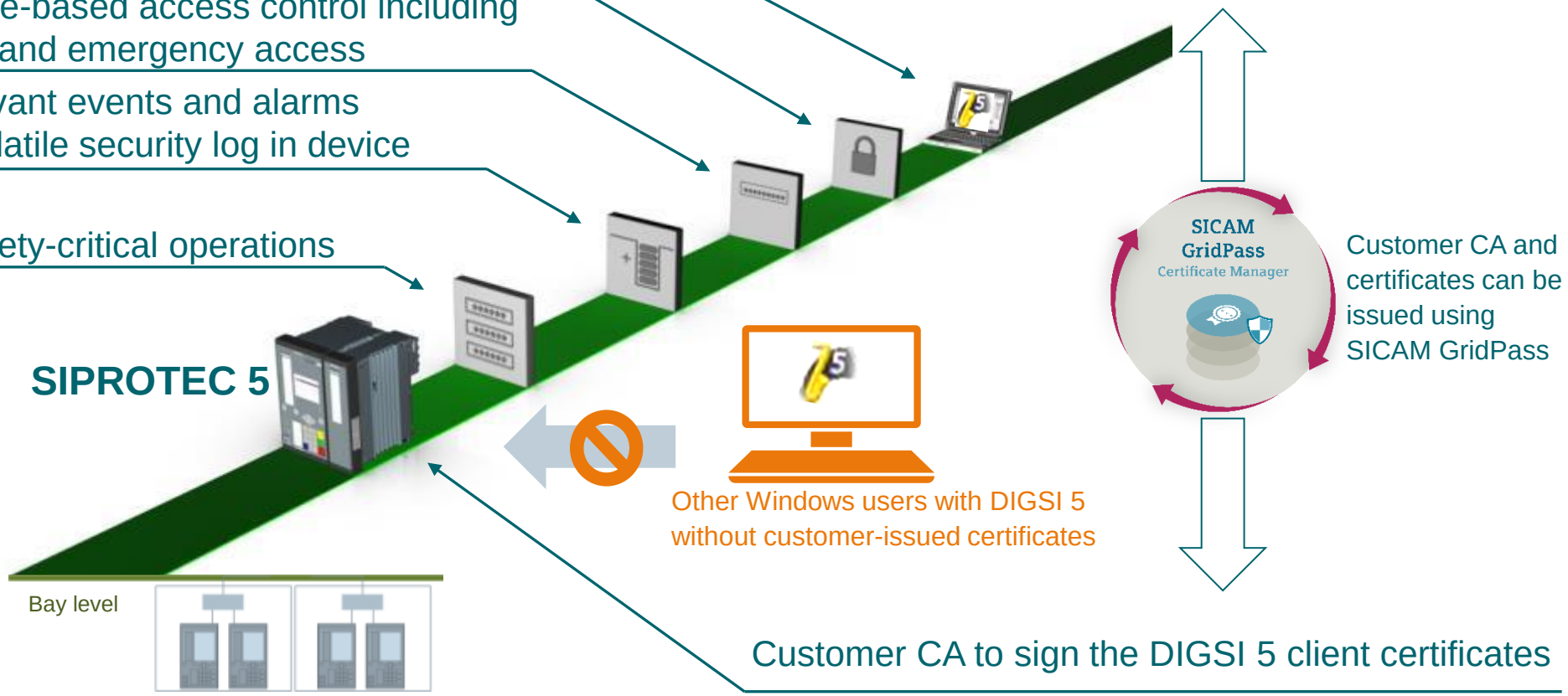
Mutually authenticated und encrypted communication between DIGSI 5 and the SIPROTEC 5 device
Only DIGSI 5 installations that connect using certificates signed by customer's CA are permitted

Device-side support for role-based access control including central user management and emergency access

Recording of security-relevant events and alarms over Syslog and in non-volatile security log in device

Confirmation codes for safety-critical operations

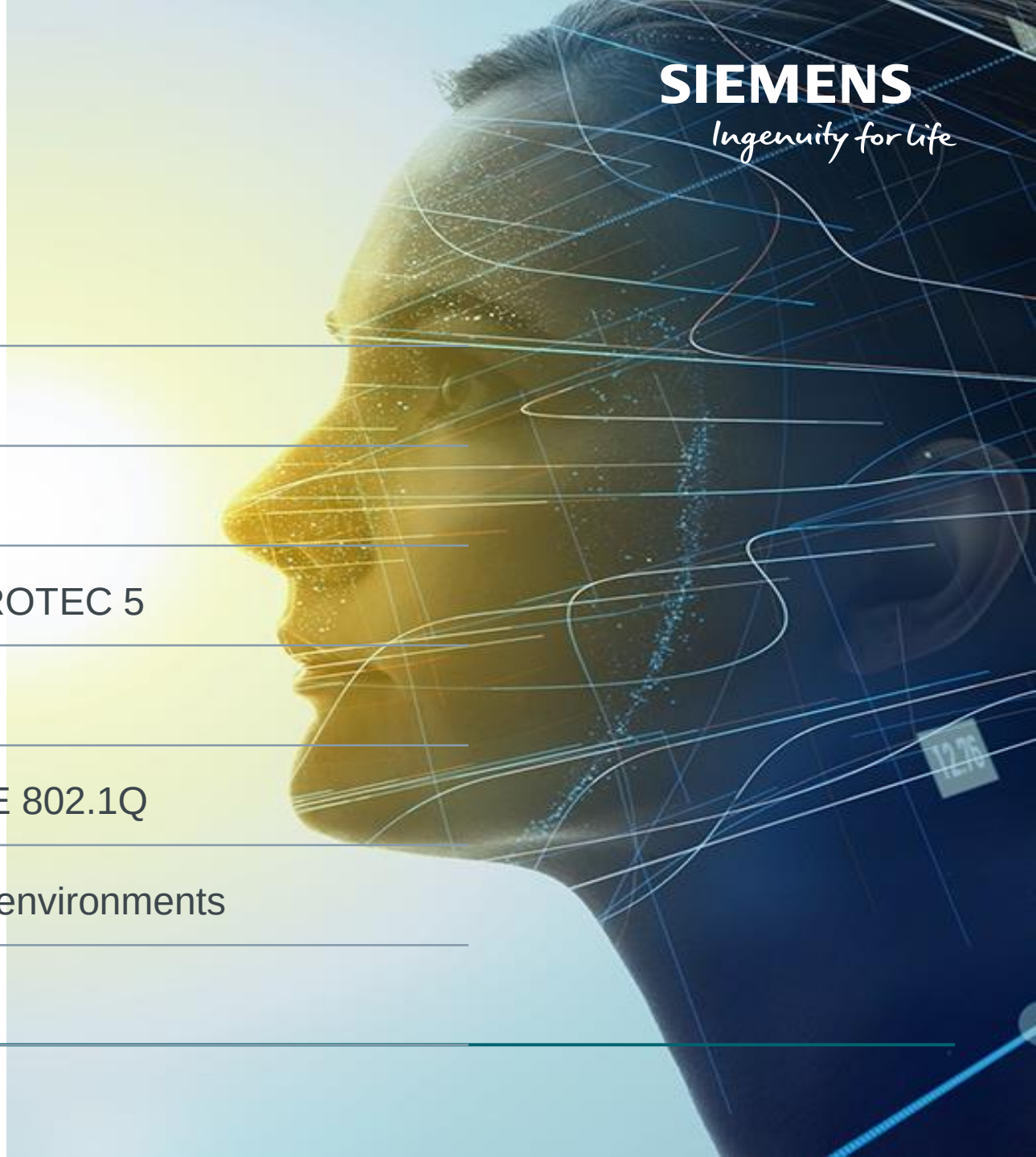
Client authorization: Customer-issued Client certificate in the Windows User account



Customer CA and certificates can be issued using SICAM GridPass

Customer CA to sign the DIGSI 5 client certificates

Content



NEW: Authenticated Network Access IEEE 802.1X

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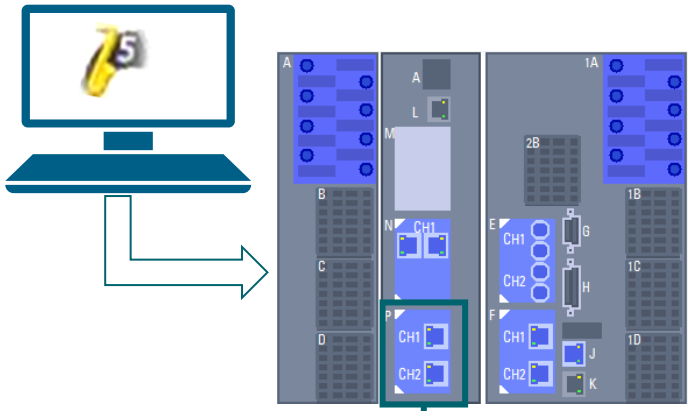
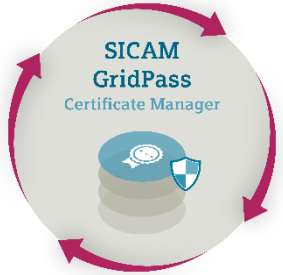
Ingenuity for life

1. Install customer-issued IEEE 802.1X Client certificates for COM modules (for network client authentication)

1. Install customer-issued IEEE 802.1X CA certificate in RADIUS Server

Customer CA und certificates can be created and managed with SICAM GridPass





RADIUS Server

Line mode, not in Ring mode

IEEE 802.1X capable Switch

2. During bootup, the device's COM module presents the client certificate for authentication to the switch using IEEE 802.1X

3. RADIUS Server authenticates the device using its certificate and the switch grants or denies network access to the COM module

Other products without customer-issued IEEE 802.1x client certificates

NEW: Authenticated Network Access IEEE 802.1X

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Problem

- Any network device can join the management network without authentication.
- Unauthorized devices in the network exposes risks of the internal network

Solution

- Centrally login each network device through Radius Authentication Server before the telegrams are accepted or forwarded to network
- The authentication facility is established through network switches, where they will act as a guardian for unauthorized access

IEEE 802.1X Supplicant

IEEE 802.1X Authenticator

IEEE 802.1X Radius Authentication Server

Function

- ETH-BA-2EL, ETH-BB-2FO, ETH-BD-2FO modules provide IEEE 802.1X supplicant support. This enables Siprotec 5 devices to join IEEE 802.1X authenticated networks

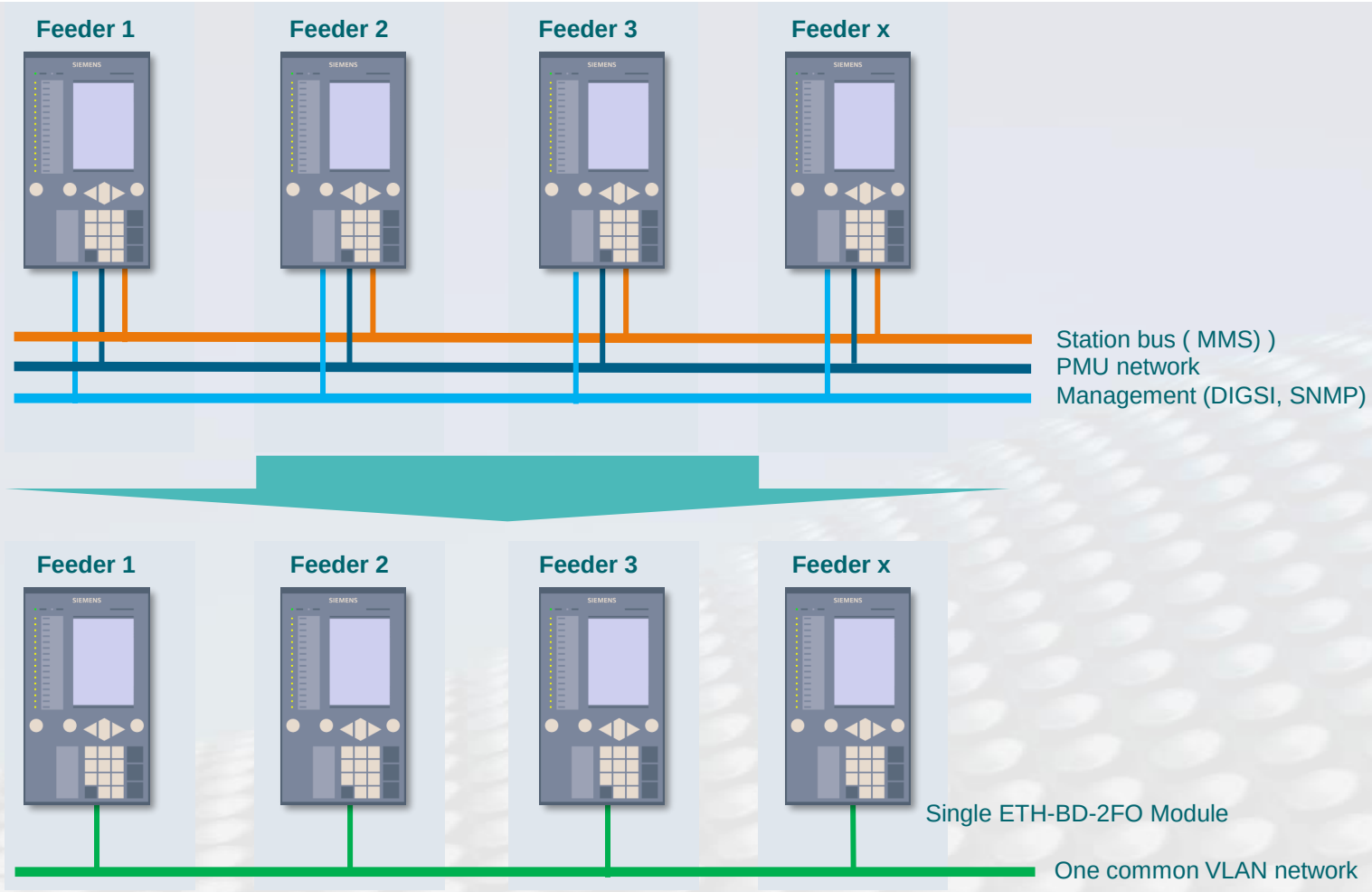
Benefits

- Cryptographically prevent undesired access to the sensitive networks
- Tunneled communication in between network devices that provides confidentiality
- Centrally manage access credentials using Radius Server

Content

Network architectures VLAN

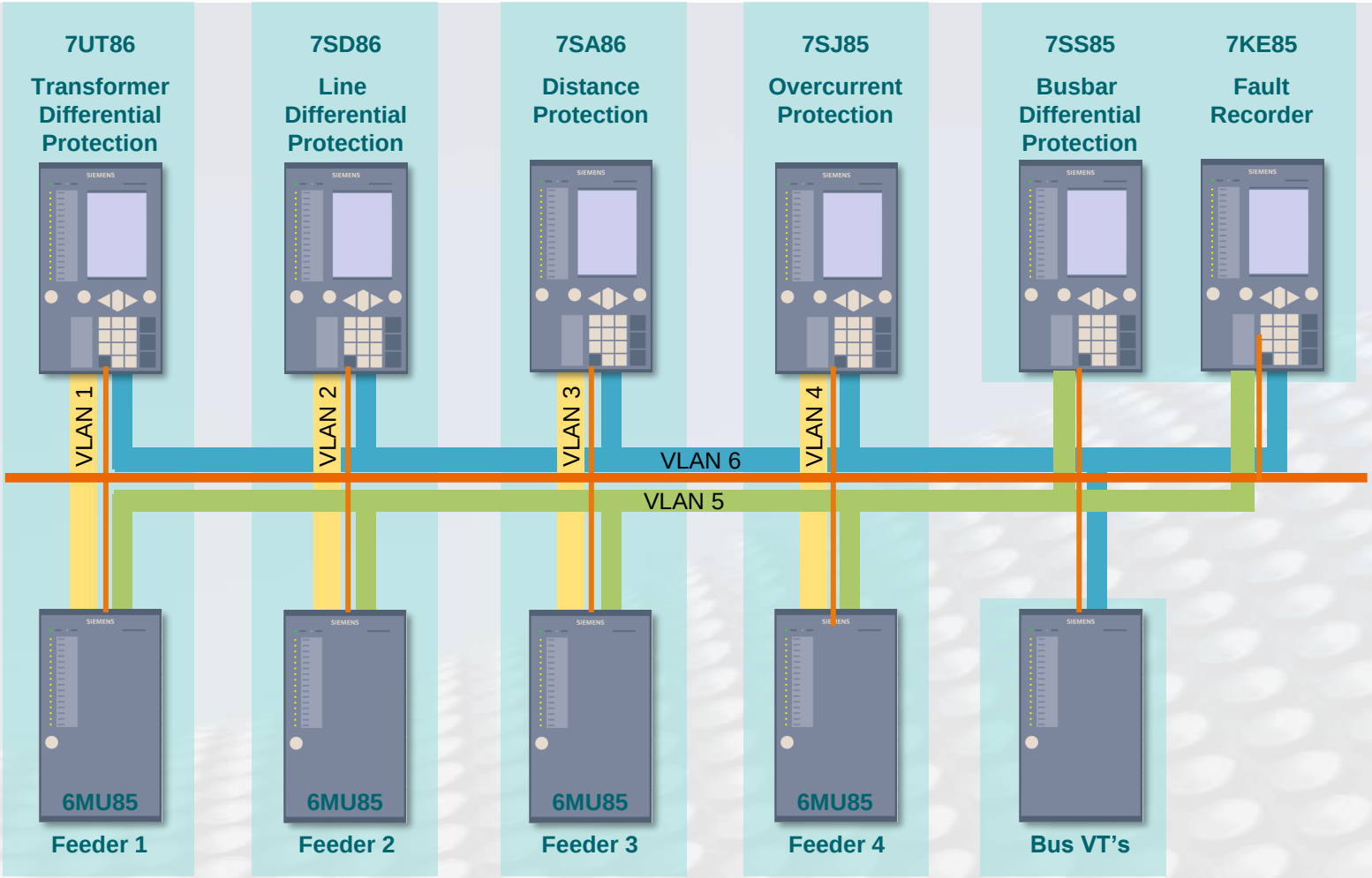
Single ETH-BD-2FO module for all your communication



Simplify your network

- From 3 networks to 1 network
- Logical (VLAN) segregation of
  - Station bus
  - PMU network
  - Management network

Network architectures
Virtual network segregation (VLAN) process bus



Simplify complexity

Segregation of one redundant process bus network into several virtual LANs reduces load and increases cyber security

One physical network reduces network costs

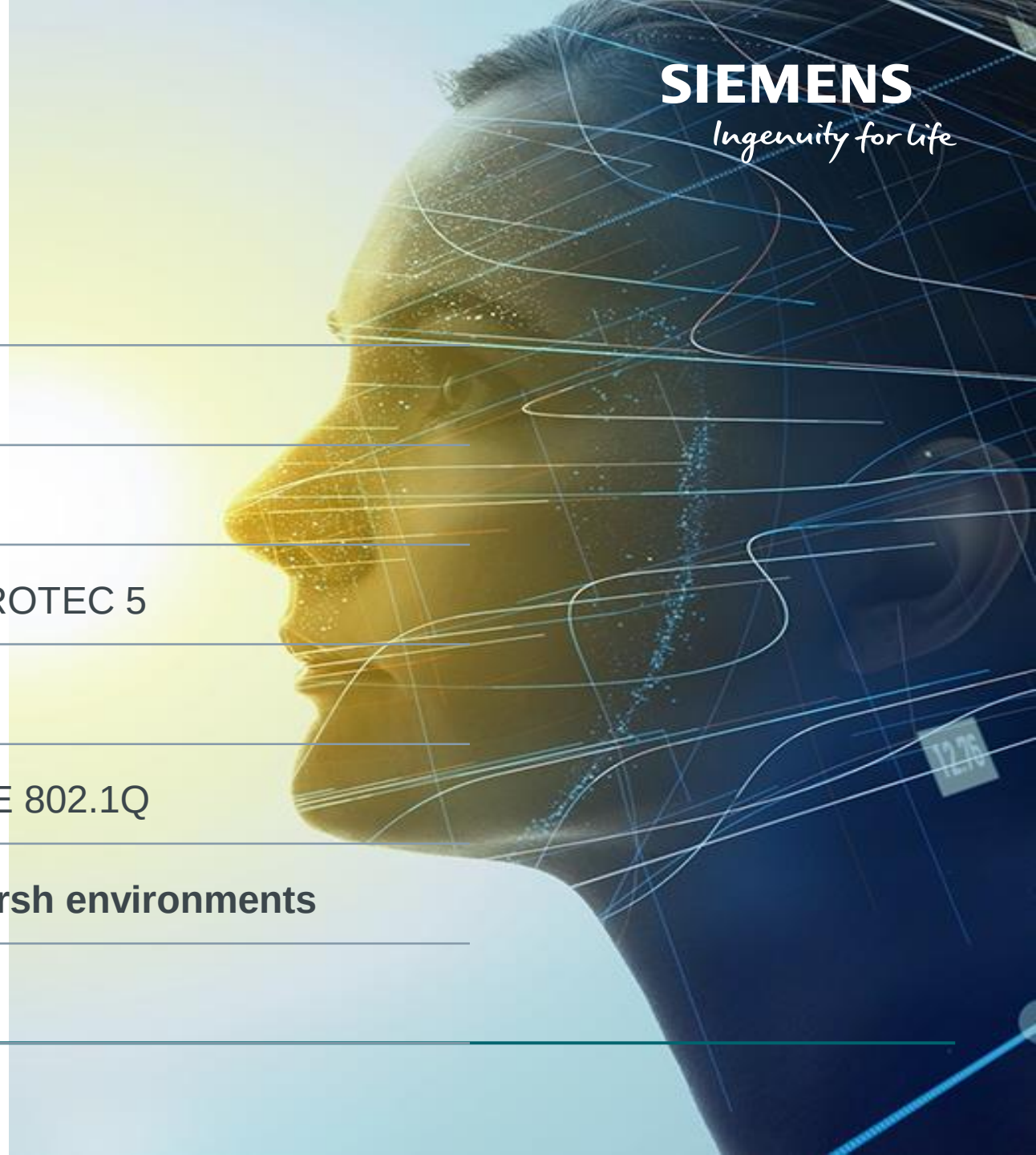
VLAN 1-4: CT, VT values for feeder protection

VLAN 5: Feeder CT values for busbar protection and fault recorder

VLAN 6: Bus VT for central fault recorder and feeder protection

Note: Seamless networks redundancy recommended

Content



Conformal coating as standard –
Maximum lifetime under extreme industrial conditions

SIEMENS
Ingenuity for life

SIPROTEC devices with Conformal Coating

- Double-sided coating standard for all modules
- Optimum quality of coating thanks to certified manufacturing process
- As standard, without additional cost for all new orders of SIPROTEC 5 and SIPROTEC Compact devices.

Customer benefits

- Increased protection for SIPROTEC devices even under extreme environmental conditions: Humidity, harmful gases, and aggressive dust, chemicals, salts and combinations of any of these
- Additional mechanical protection from abrasion, and insects as well as improper handling

SIEMENS
Ingenuity for life

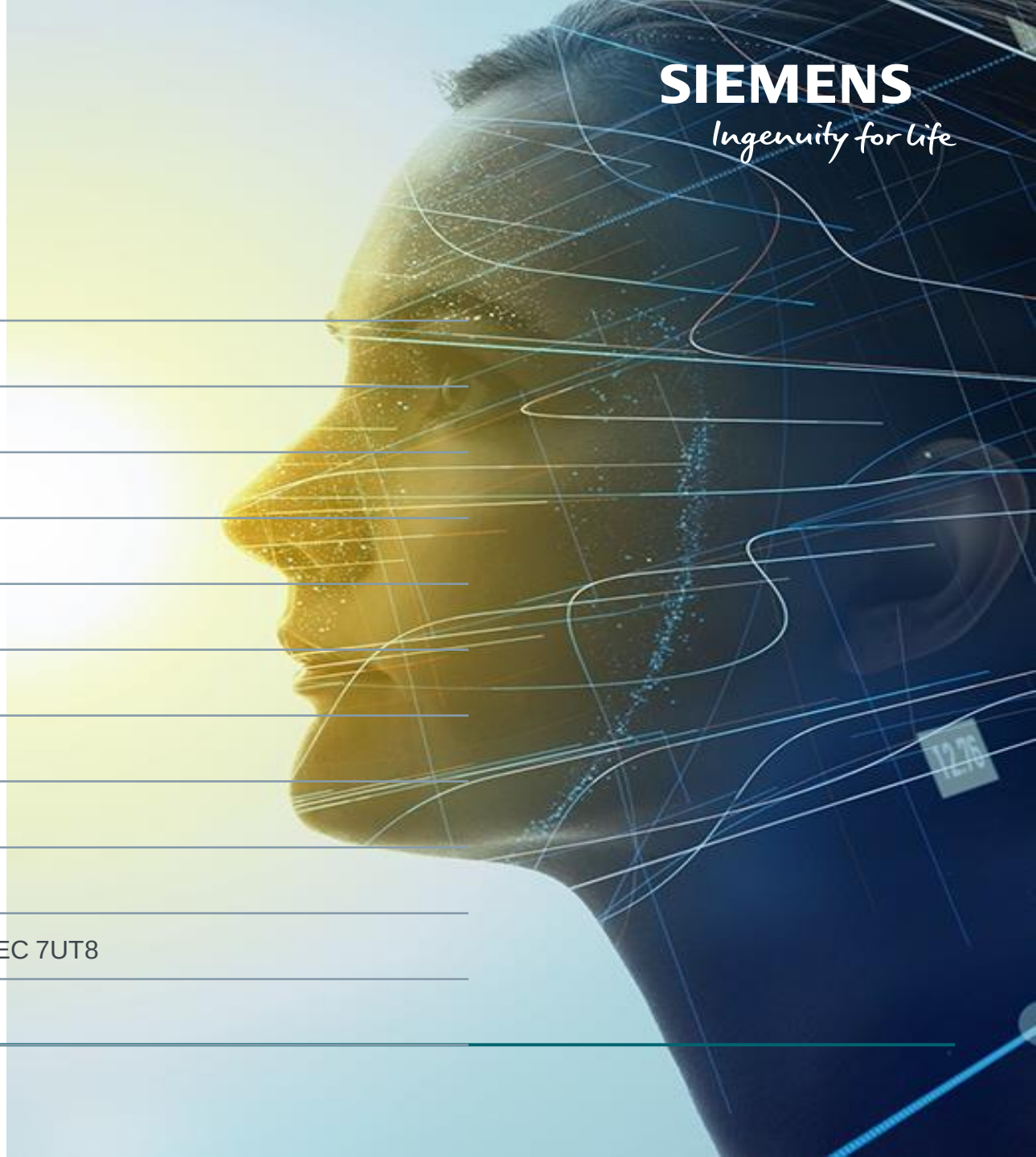
SIPROTEC 5

Strong in industrial application

Release V08.30

siemens.com/siprotec5

Content



NEW: Easier filtering of routing information

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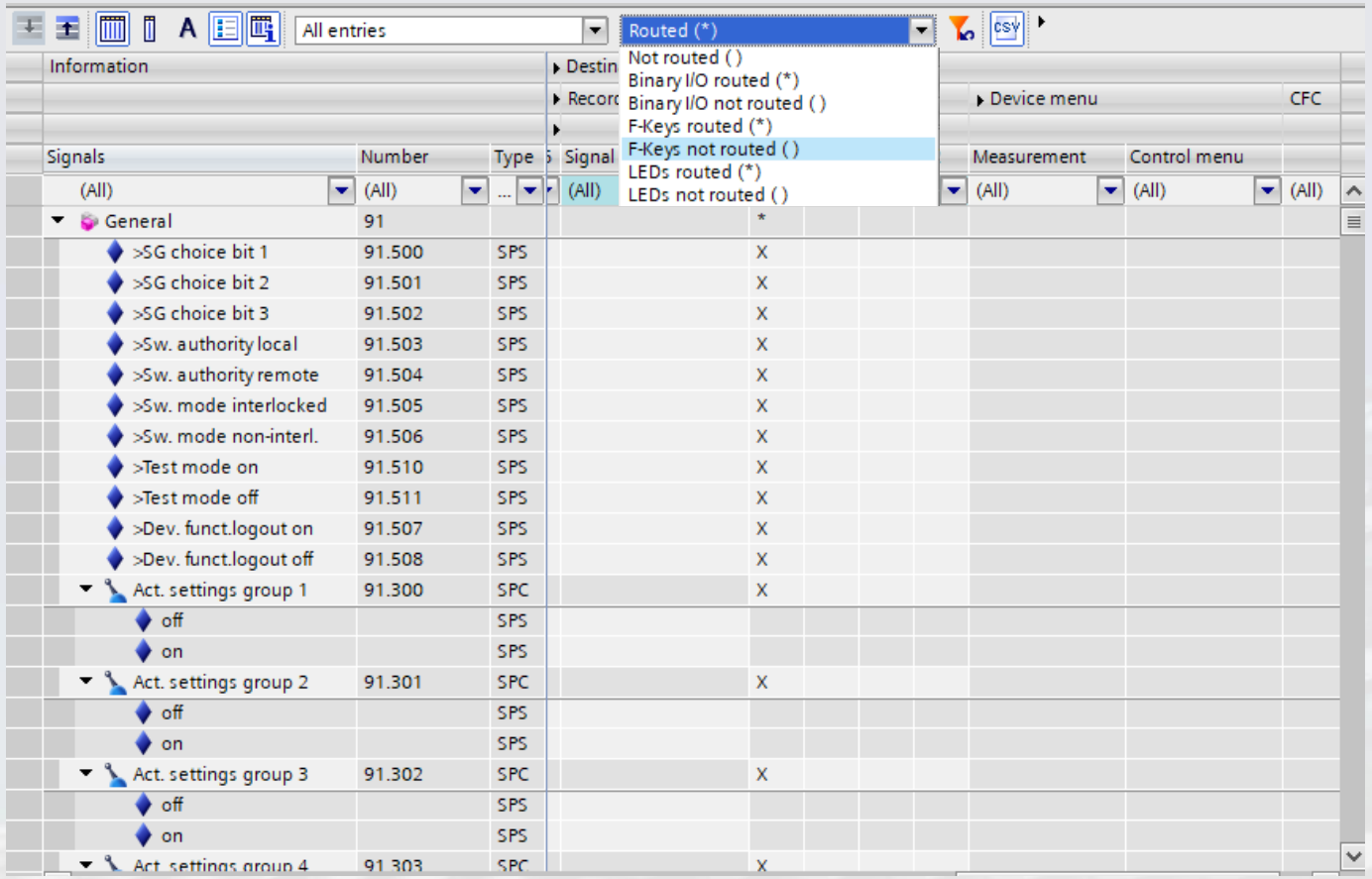
Ingenuity for life



Simplify complexity

- Routing filter to your needs
- Binary inputs, F-Keys and LEDs

NEW: Your favorite settings at a glance

Easier setting of parameters with favorites

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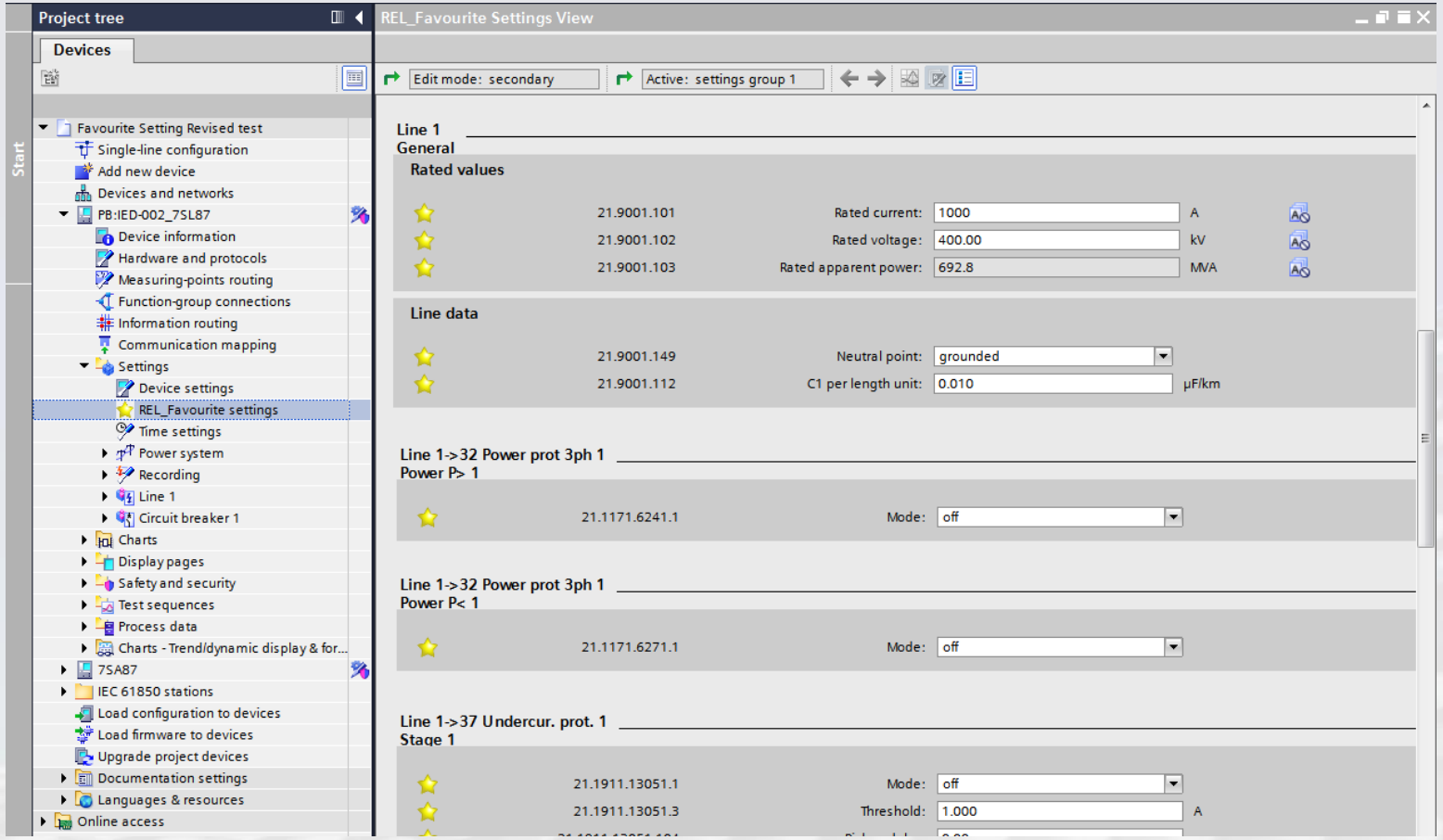
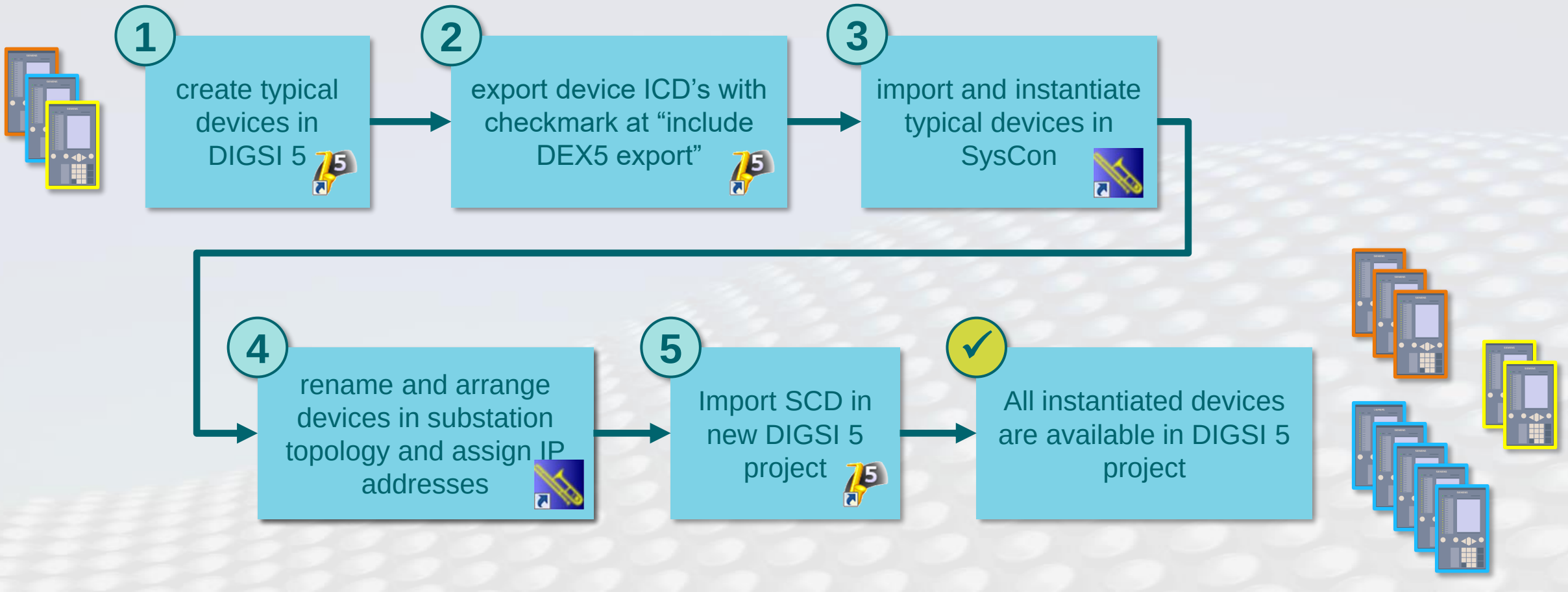


Simplify complexity

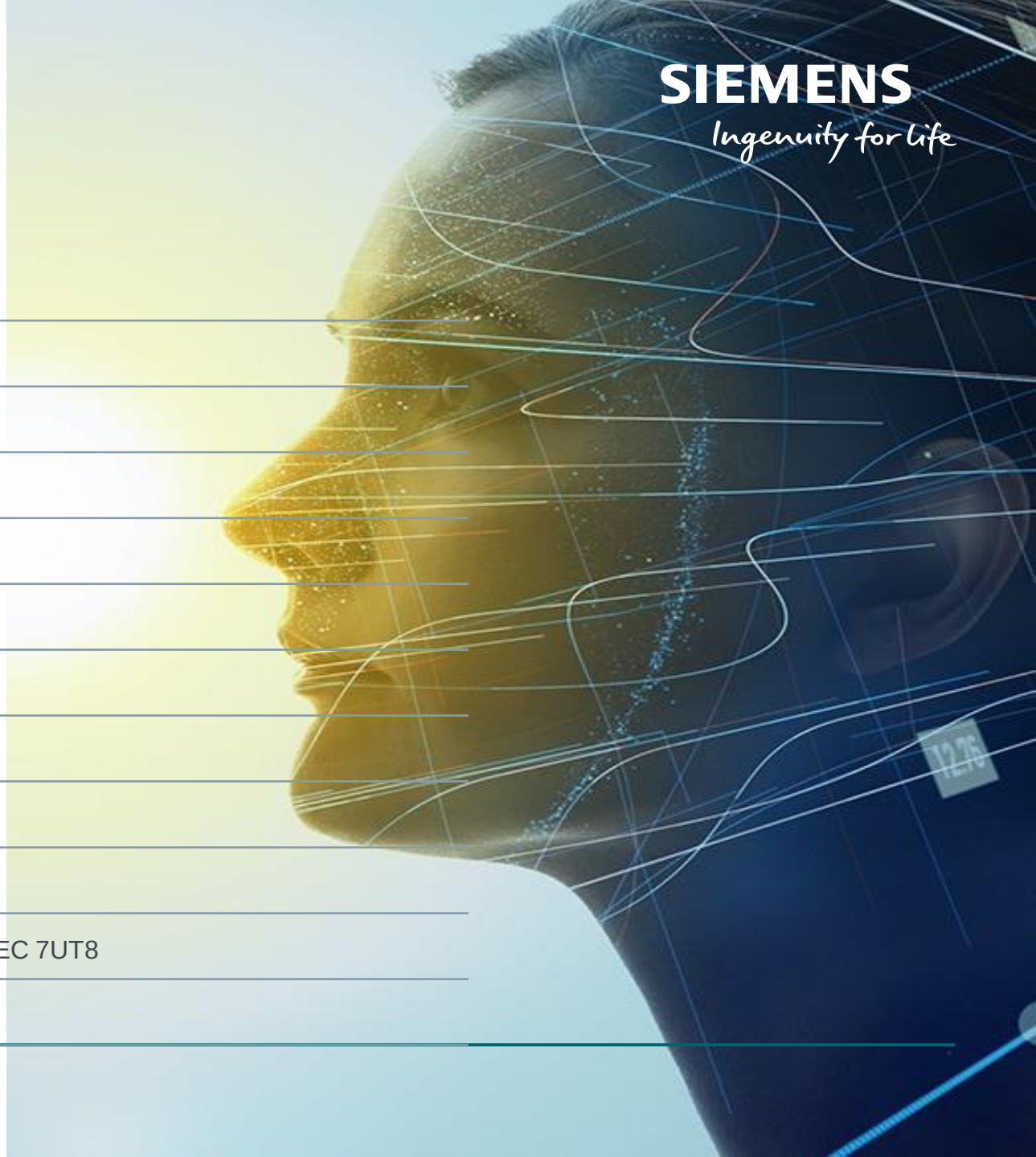
- All relevant settings at a glance
- Settings for one bay on one screen
- Reduced training
- Reduced risk of changing wrong parameter

Designed to communicate

NEW: Automated IEC 61850 engineering with bay typicals



Content



Designed to communicate
Profinet IO with S2 Redundancy

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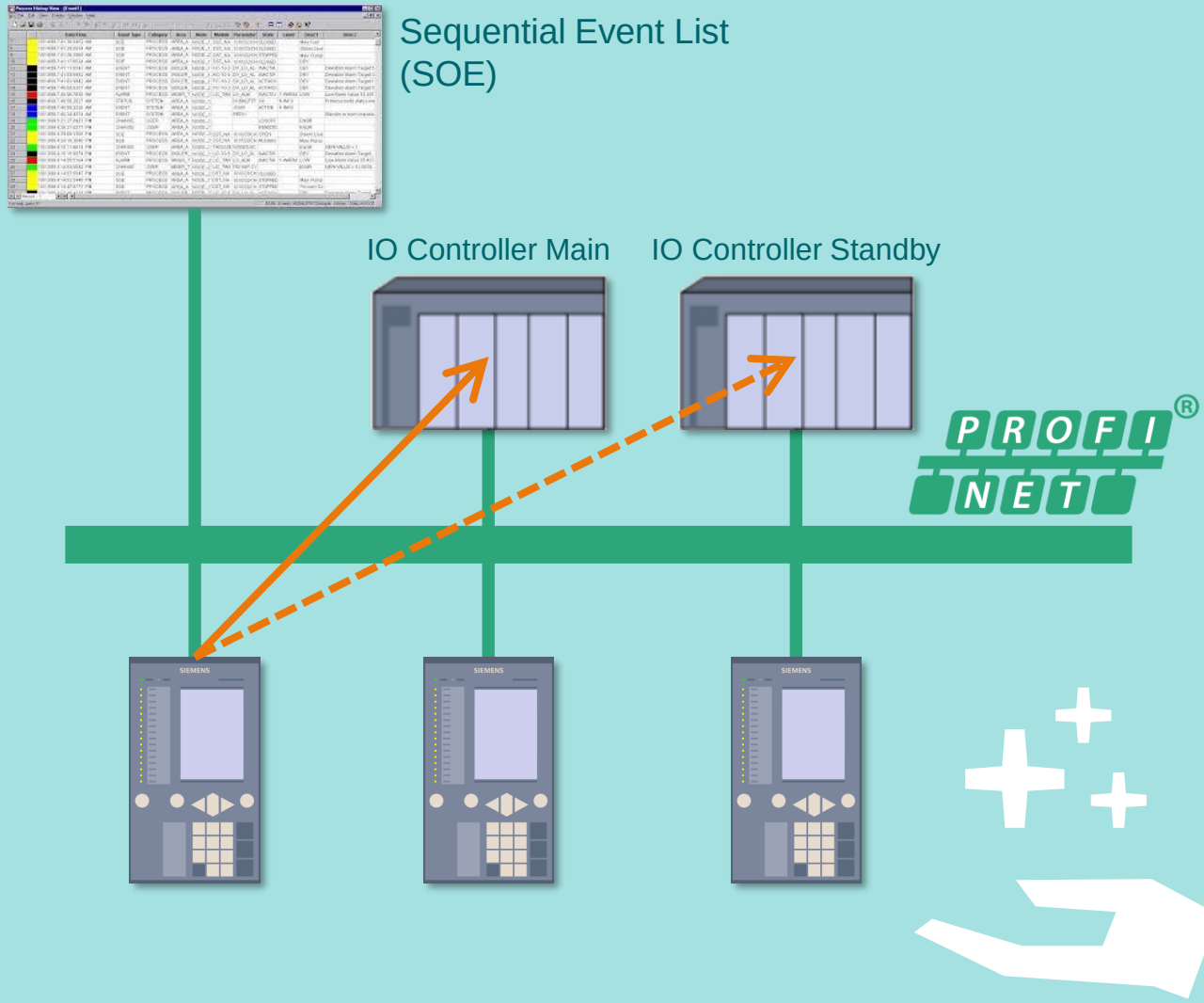
NEW:* Profinet IO on **ETH-BD-2FO**

NEW:* High availability connection of SIPROTEC 5 as an IO device to two redundant Profinet IO Controllers

NEW:* Sequence of Events log from the SIPROTEC 5 IO device to enable monitoring of Process data from your factory

Effortless integration into existing Profinet IO networks with optional RJ-45 SFP

*ETH-BD-2FO plug-in module is required



SIPROTEC 5
Ethernet module – ETH-BD-2FO

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Communication module for the transmission of Ethernet protocols via 2 optical interfaces

NEW: Additional protocols (Device DDD V8.30)

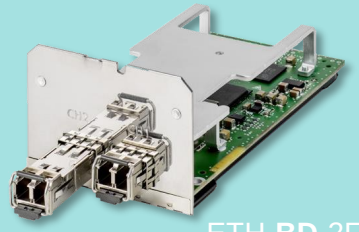
- HSR (no IEEE 1588v2/PTP support)
- IEEE C37.118 (PMU)
- Profinet IO incl. S2 redundancy
- IEEE 1588v2/PTP support C37.238:2017 profile

Available protocols (Device DDD V8.03)

- PRP, Line Mode, RSTP
- IEC 61850-8-1 GOOSE, MMS
- IEC 60870-5-104
- SNTP
- COMFEDE support via MMS file transfer
- IEEE 1588v2/PTP (1µs accuracy) ordinary slave clock for radial networks (PRP and Line Mode) – IEC 61850-9-3 profile
- DIGSI 5 protocol
- DCP
- DHCP
- Homepage
- WebUI
- SysLog
- RADIUS
- IEC 61850-9-2 Process Bus Client
- IEC 61850-9-2 Merging Unit

Technical Specification:

Connector type	2 x duplex LC
Wavelength	λ = 1300 nm
Baud rate	100 Mbit/s
Max. line length	2 km for 62.5 µm/125 µm optical fibers



ETH-**BD**-2FO

Transmit Power	Minimum	Typical	Maximum
50 µm/125 µm, NA1 = 0.2	-24.0 dBm	-21.0 dBm	-17.0 dBm
62.5 µm/125 µm, NA1 = 0.275	-20.0 dBm	-17.0 dBm	-14.0 dBm

Receiver sensitivity	Maximum -12.0 dBm Minimum -31.0 dBm
Optical budget	Minimum 7.0 dB for 50 µm/125 µm, NA1 = 0.2 Minimum 11.0 dB for 62.5 µm/125 µm, NA1 = 0. 275
Interface design	Corresponds to IEEE 802.3, 100Base-FX
Laser class 1 as per EN 60825-1/-2	With the use of 62.5 µm/125 µm and 50 µm/125 µm optical fibers

Comment: 1 Numerical Aperture (NA = sin θ (launch angle))

Optional SFP for the ETH-BD-2FO
as replacement of standard multimode SFP for 2 km

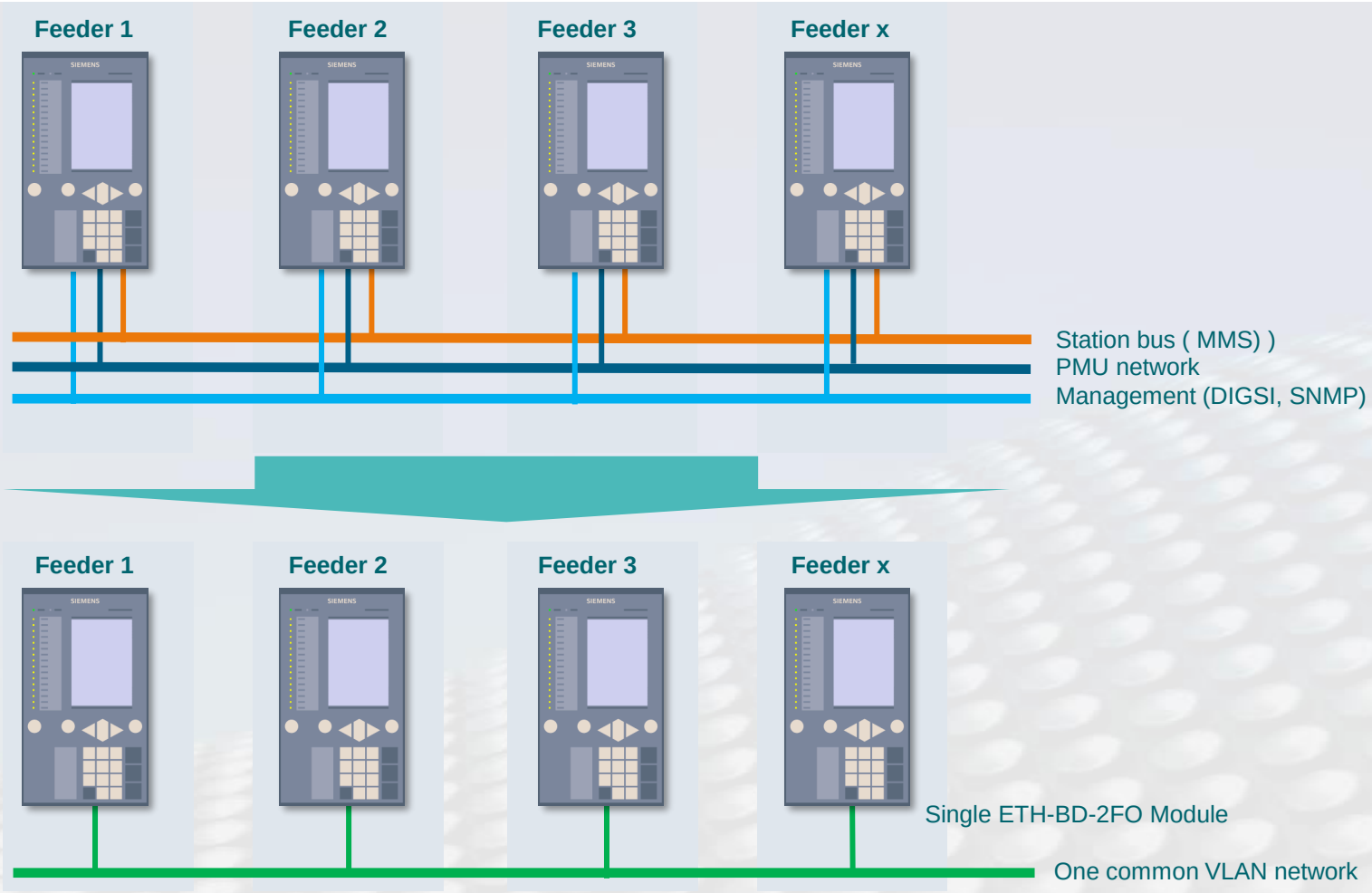
SIEMENS
Ingenuity for life

Optical SFP for up to 24 km	
Order Code	P1Z3210 (pack of 10 units)
Connector type	2 x duplex LC
Wavelength	λ = 1300 nm
Baud rate	100 Mbit/s
Protocol	See ETH-BD-2FO
Max. line length	24 km for 9 µm/125 µm optical fibers

Electrical SFP for up to 20 m (not for sample synchronization)	
Order Code	P1Z3201 (pack of 10 units)
Connector type	RJ45
Baud rate	100 Mbit/s
Protocol	See ETH-BD-2FO
Max. line length	20 m with Ethernet patch cable CAT 6 S/FTP, F/FTP, or SF/FTP
Interface design	Corresponds to IEEE 802.3, 100Base-TX

Network architectures VLAN

Single ETH-BD-2FO module for all your communication



Simplify your network

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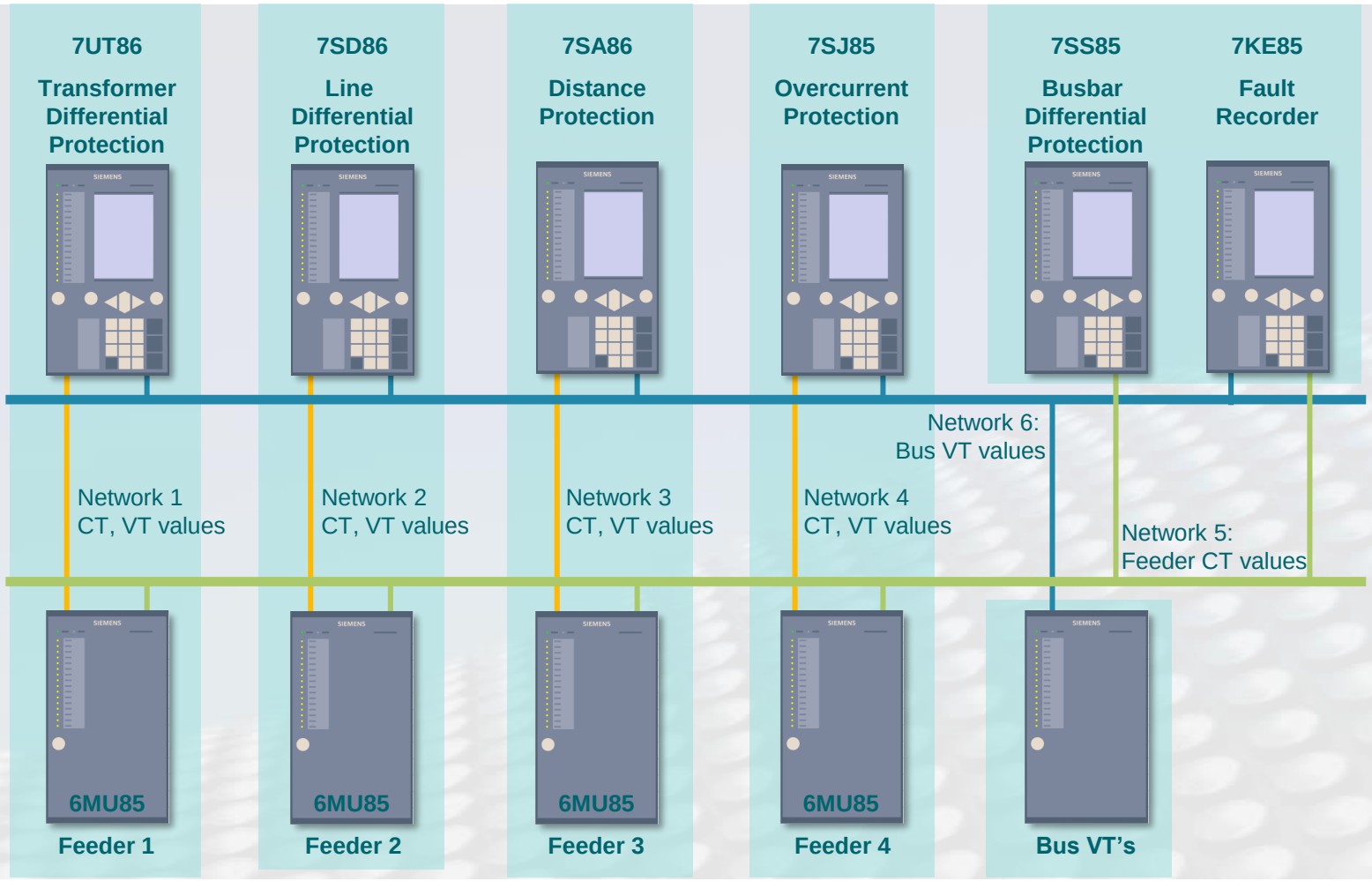
- Logical (VLAN) segregation of
  - Station bus
  - PMU network
  - Management network

Network architectures
Physically network segregation



Simplify complexity

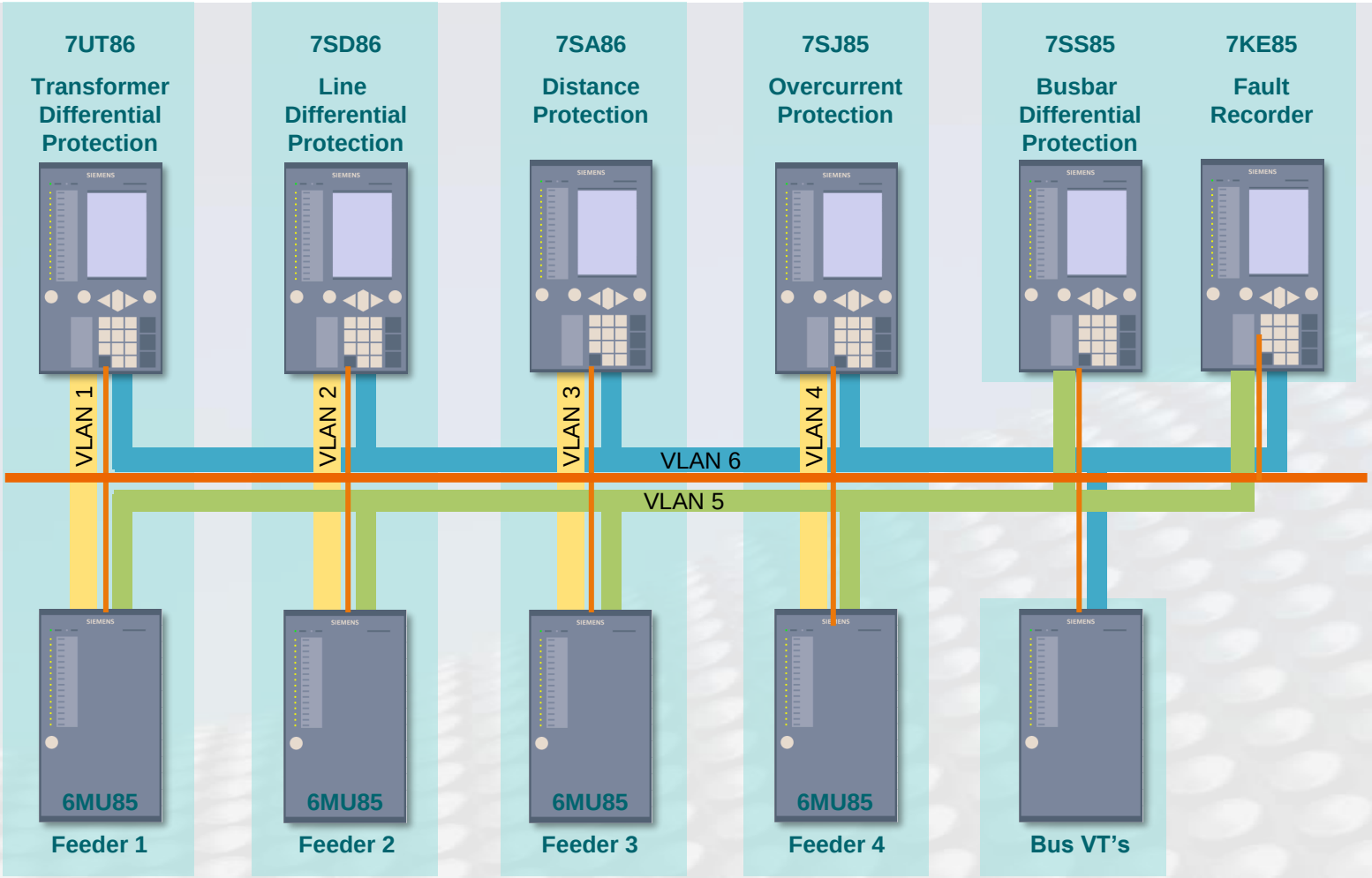
Use of more than one redundant process bus network reduces the network engineering

Increase the bandwidth with additional Ethernet interfaces

Efficient use of network bandwidth with customization of the analog values per SMV streams
(not only IEC 61850-9-2LE data set)

Note: Seamless networks redundancy recommended

Network architectures
Virtual network segregation (VLAN)



Simplify complexity

Segregation of one redundant process bus network into several virtual LANs reduces load and increases cyber security

One physical network reduces network costs

VLAN 1-4: CT, VT values for feeder protection

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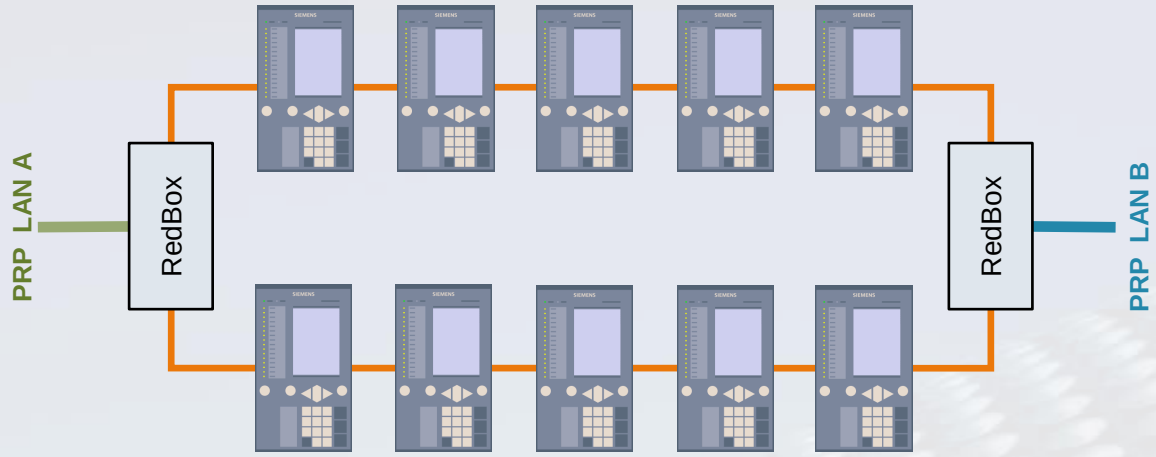
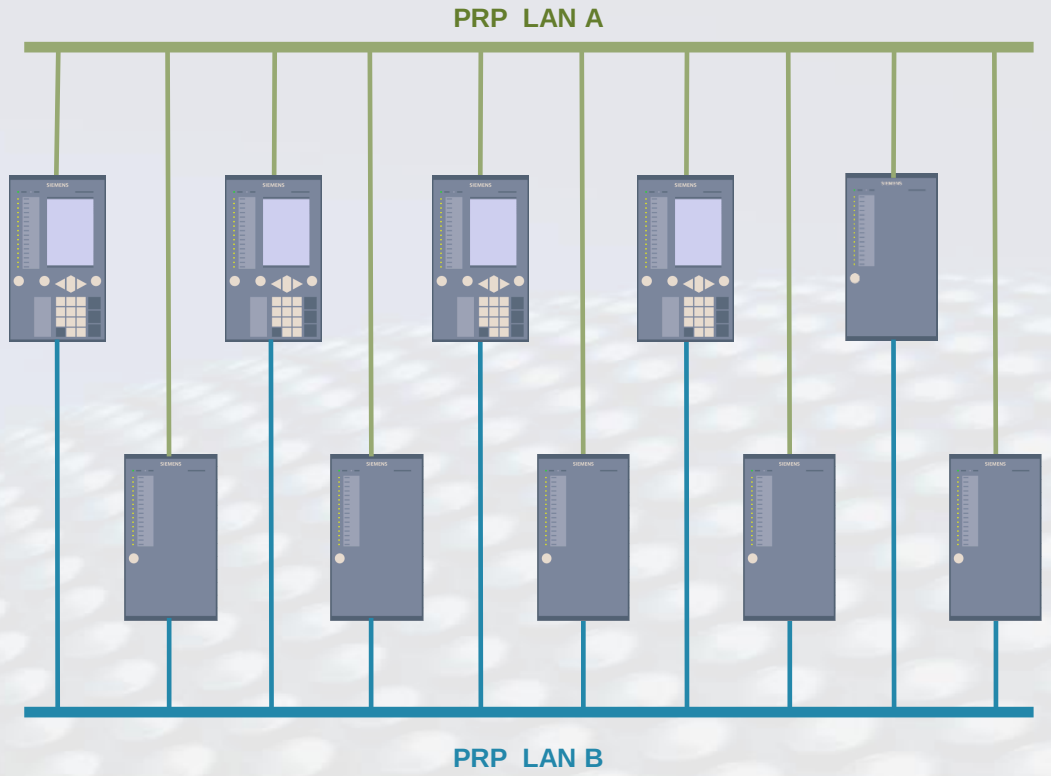
VLAN 6: Bus VT for central fault recorder and feeder protection

Note: Seamless networks redundancy recommended

Designed to communicate
HSR and PRP redundancy



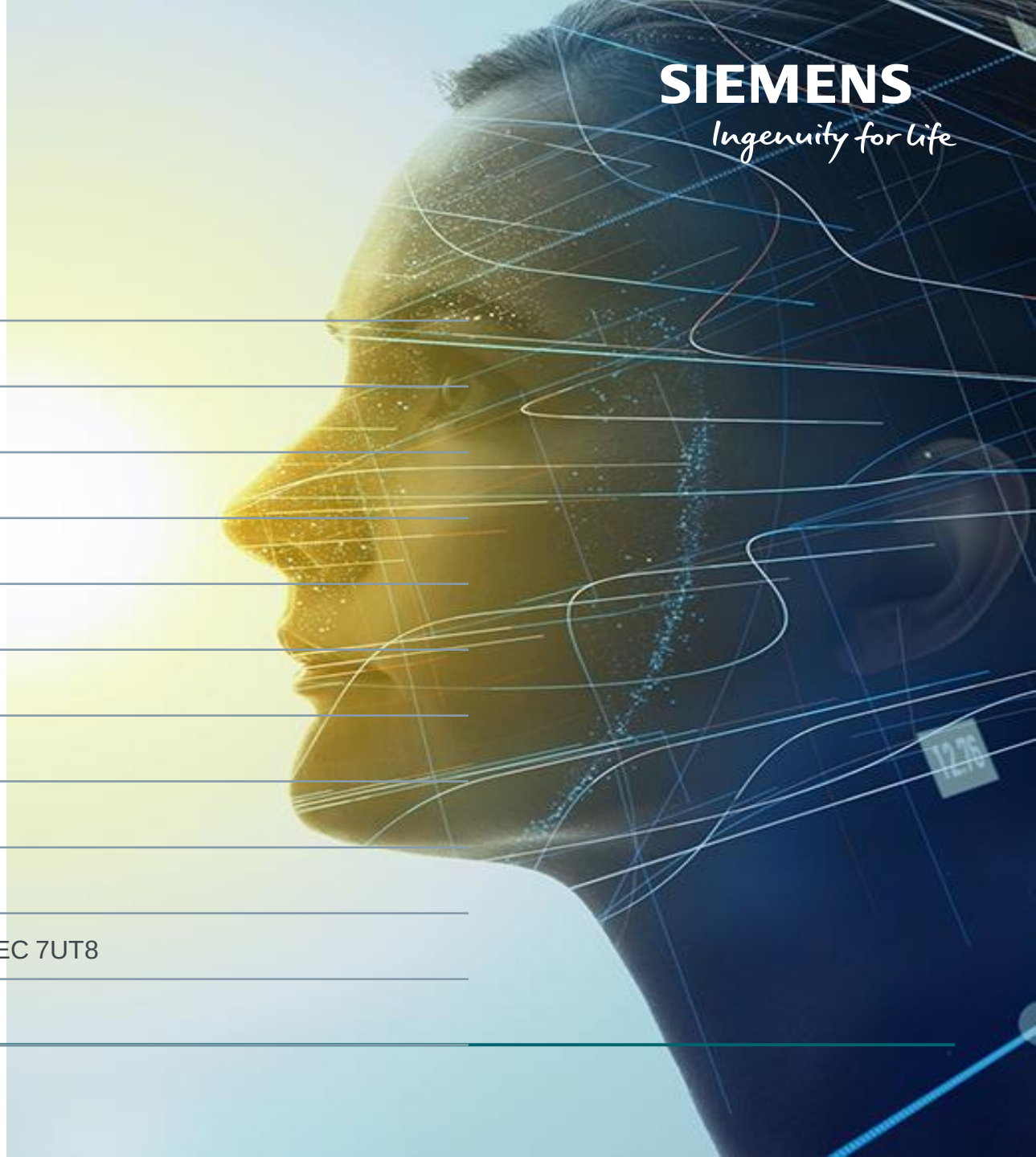
New on ETH-BD-2FO module:
HSR* ring with clients and server connected to PRP LANs



PRP redundancy with clients and server for station and process bus

* Support of IEEE 1588v2/PTP (transparent clock) in preparation

Content



Protection of 400 V grids
with SIPROTEC 5 multifunctional relays

SIEMENS
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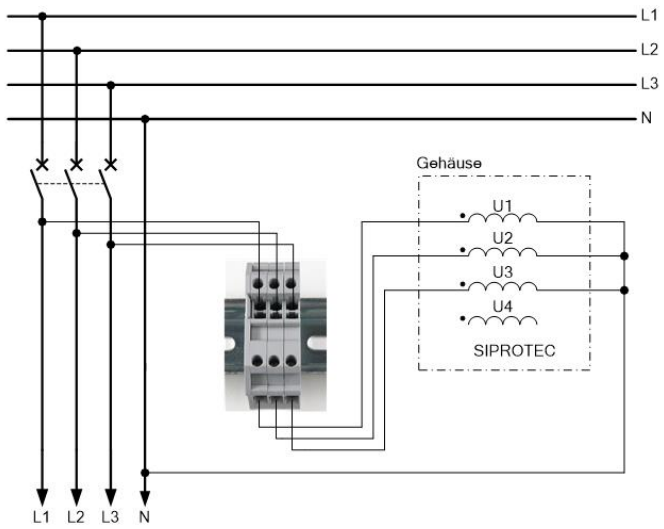
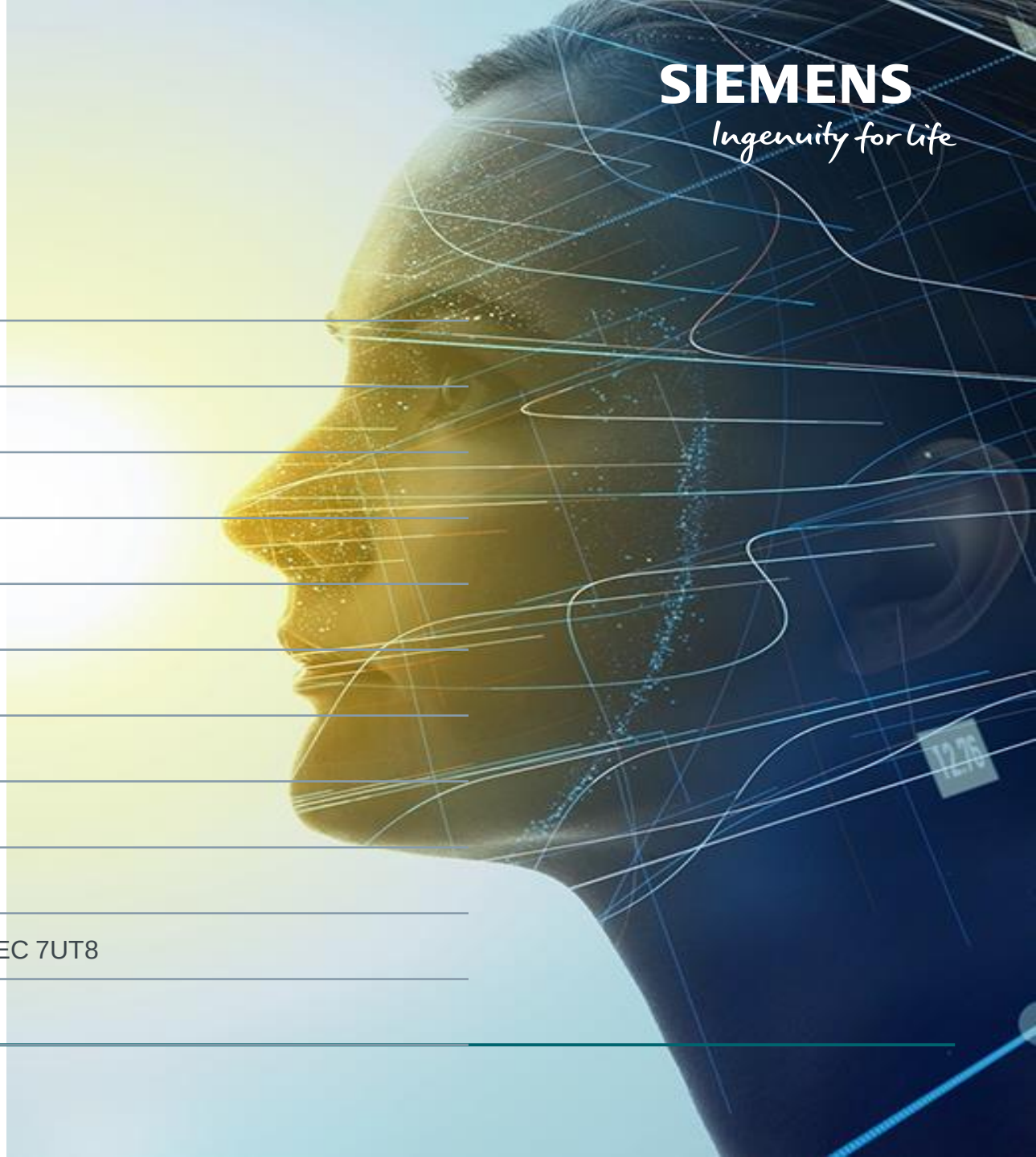
Advantages of a multi-functional SIPROTEC 5 protection device for low voltage grids



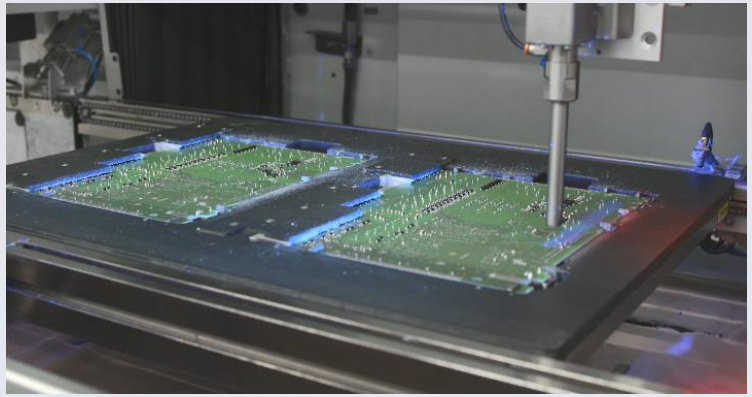
- Cost and space saving due to elimination of the external voltage transformer
- Local control of the circuit-breaker
- Remote signaling and control via control system
- Fault analysis via fault records (SIGRA)
- Power and energy recording, for internal cost controlling
- Protection function, also as backup protection for the medium voltage side of the feeding transformer
- Compliant with the EMC directive

Content



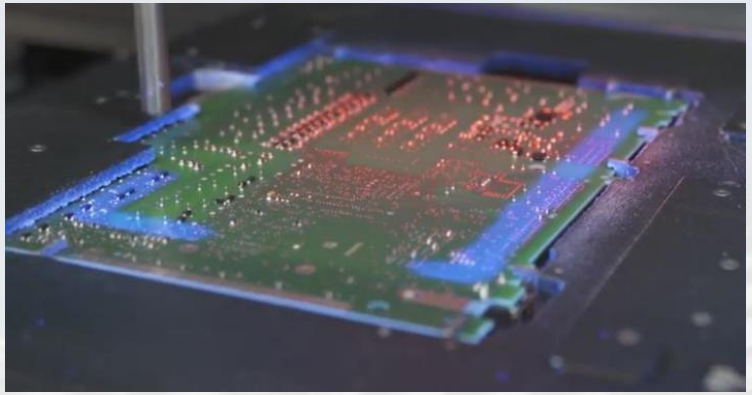
Conformal coating as standard – Maximum lifetime under extreme industrial conditions

SIEMENS
Ingenuity for life



SIPROTEC devices with Conformal Coating

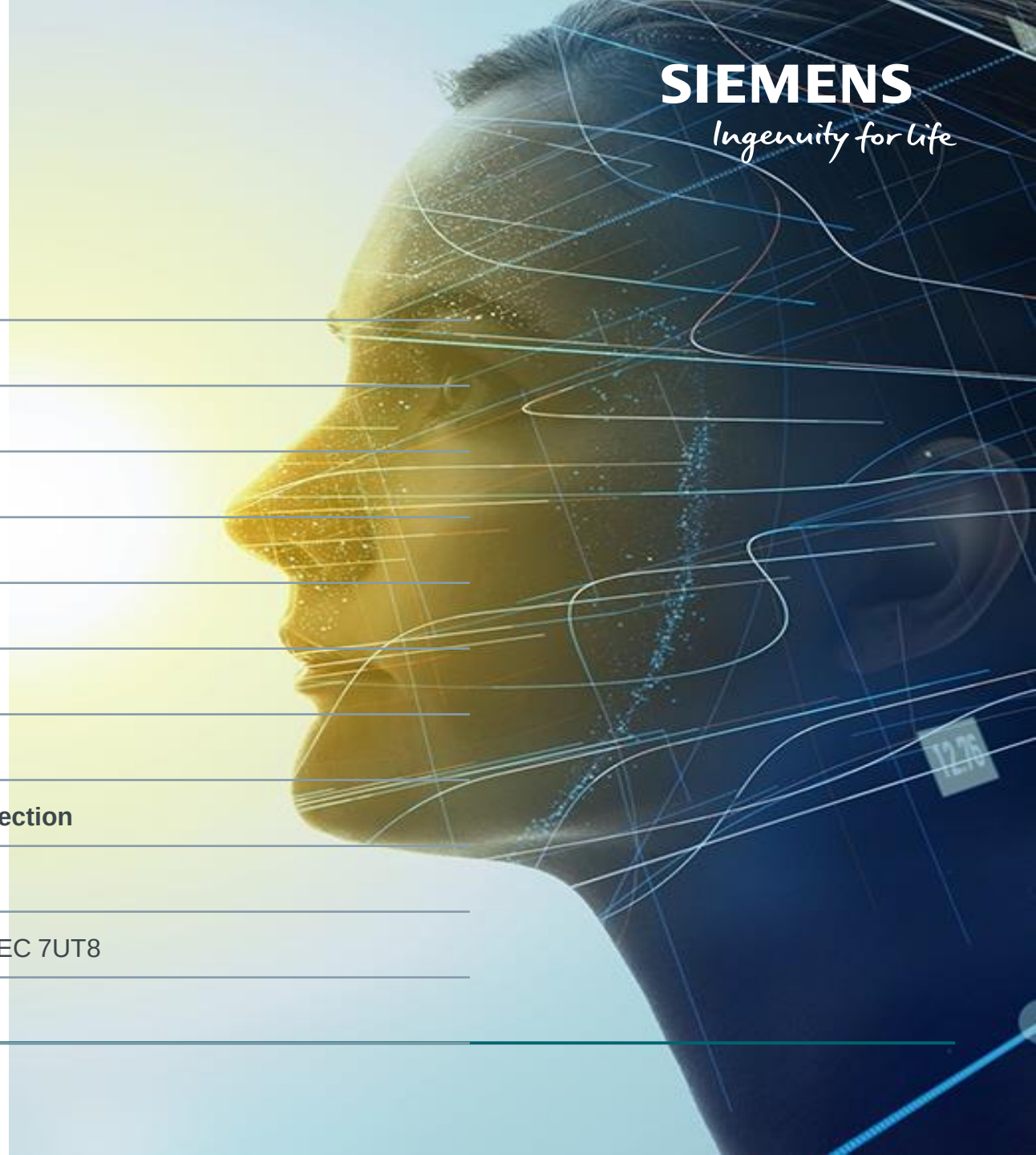
- Double-sided coating standard for all modules
- Optimum quality of coating thanks to certified manufacturing process
- As standard, without additional cost for all new orders of SIPROTEC 5 and SIPROTEC Compact devices.



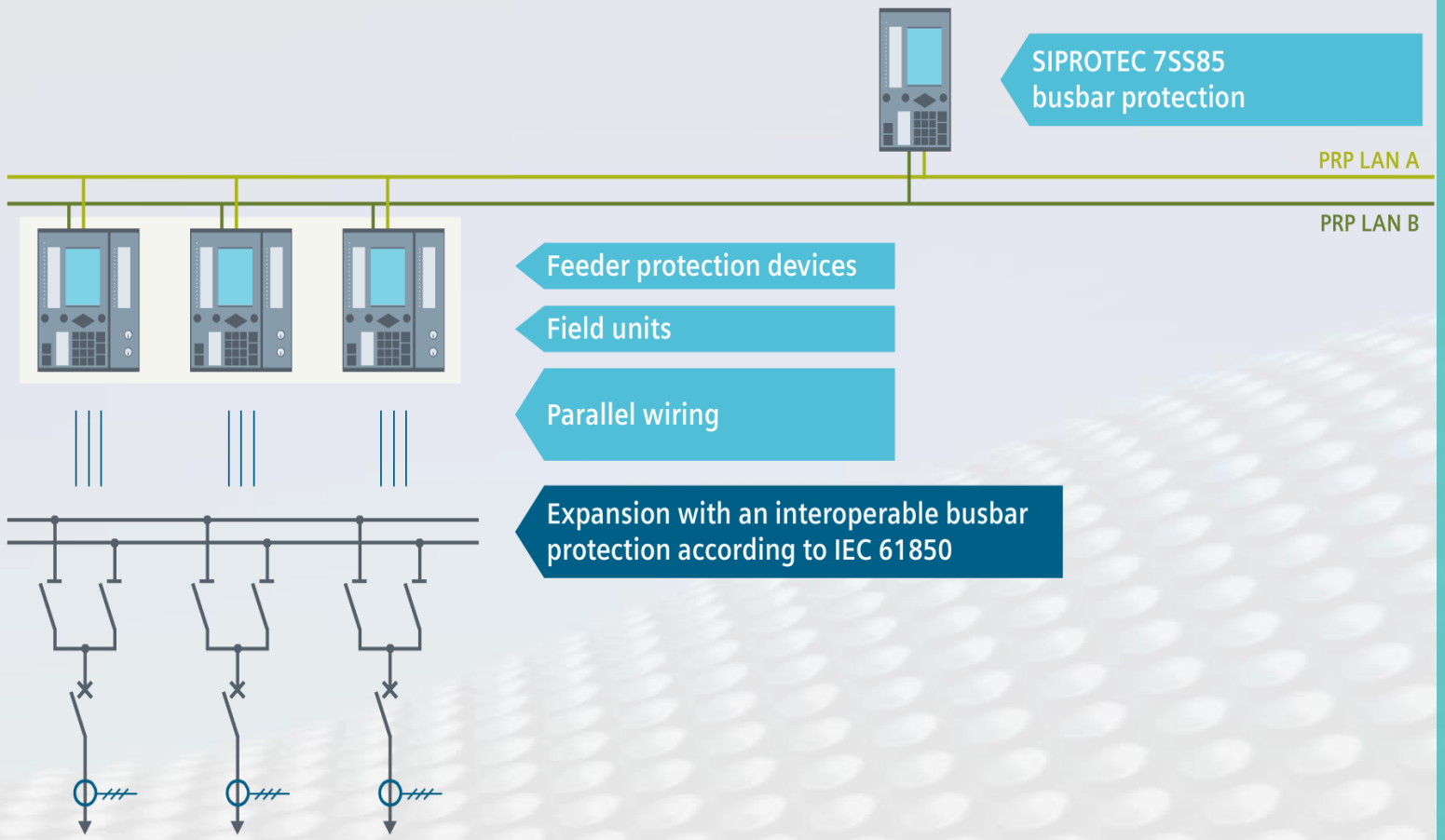
Customer benefits

- Increased protection for SIPROTEC devices even under extreme environmental conditions: Humidity, harmful gases, and aggressive dust, chemicals, salts and combinations of any of these
- Additional mechanical protection from abrasion, and insects as well as improper handling

Content



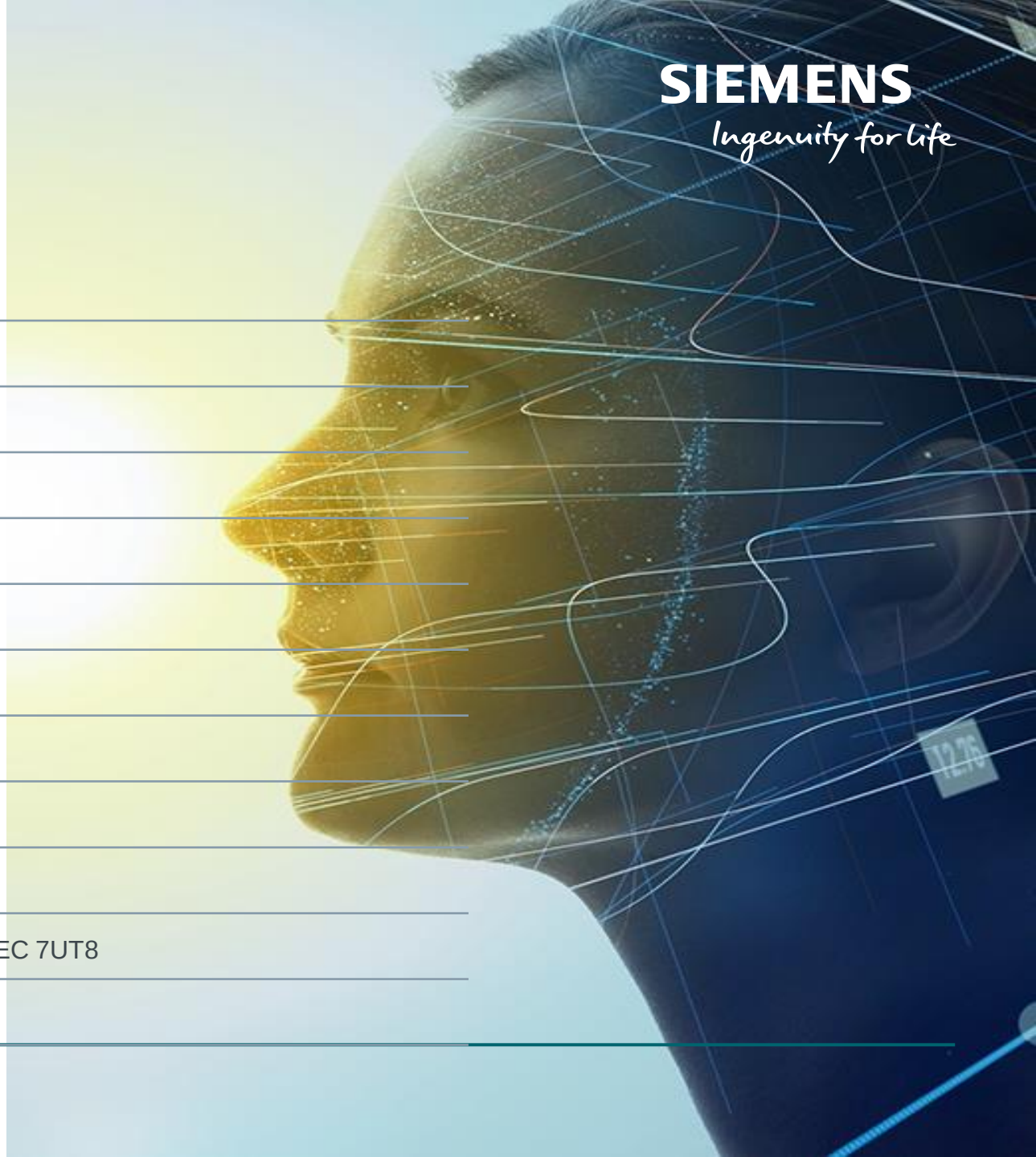
Distributed busbar protection as addition to existing feeder protection



Brownfield application

- Upgrade your protection system with a small investment
- Get a distributed busbar protection in your actual protection system just with one device and the process bus module
- Less effort and less investment
- Not additional wiring and additional CTs for busbar protection

Content



Arc Protection

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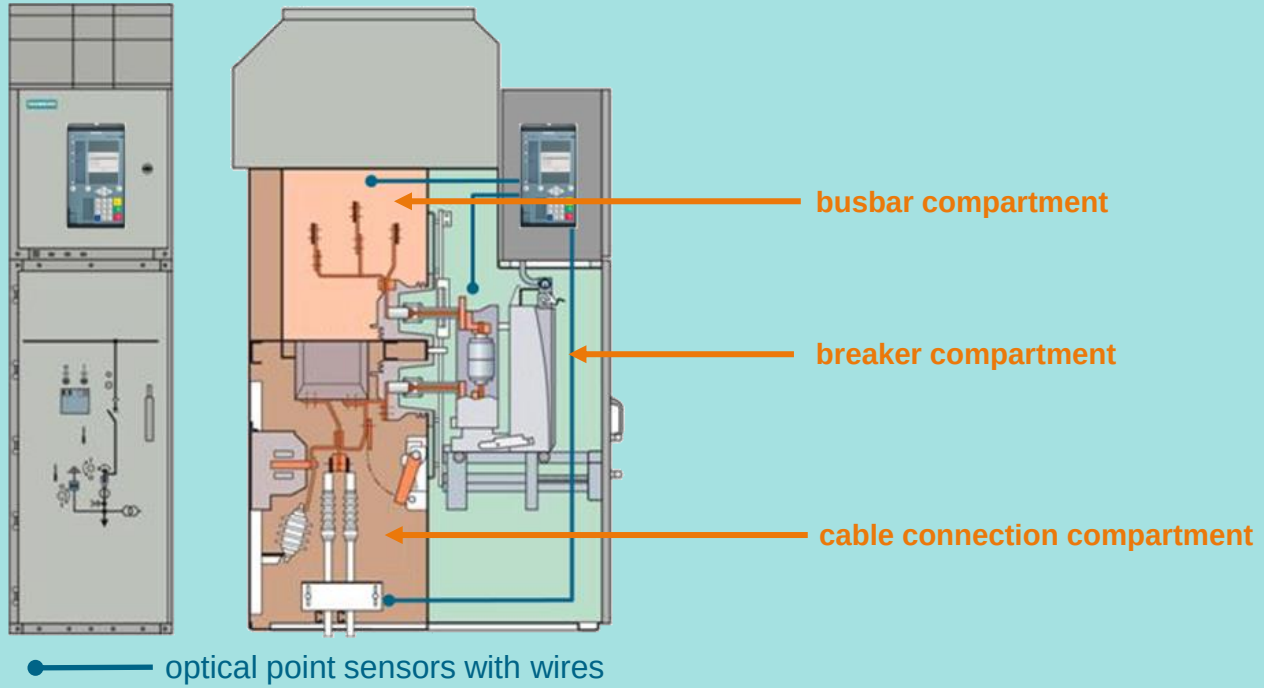
Safety First - Protection for your operation and maintenance personal (fast tripping time 3-4 ms)

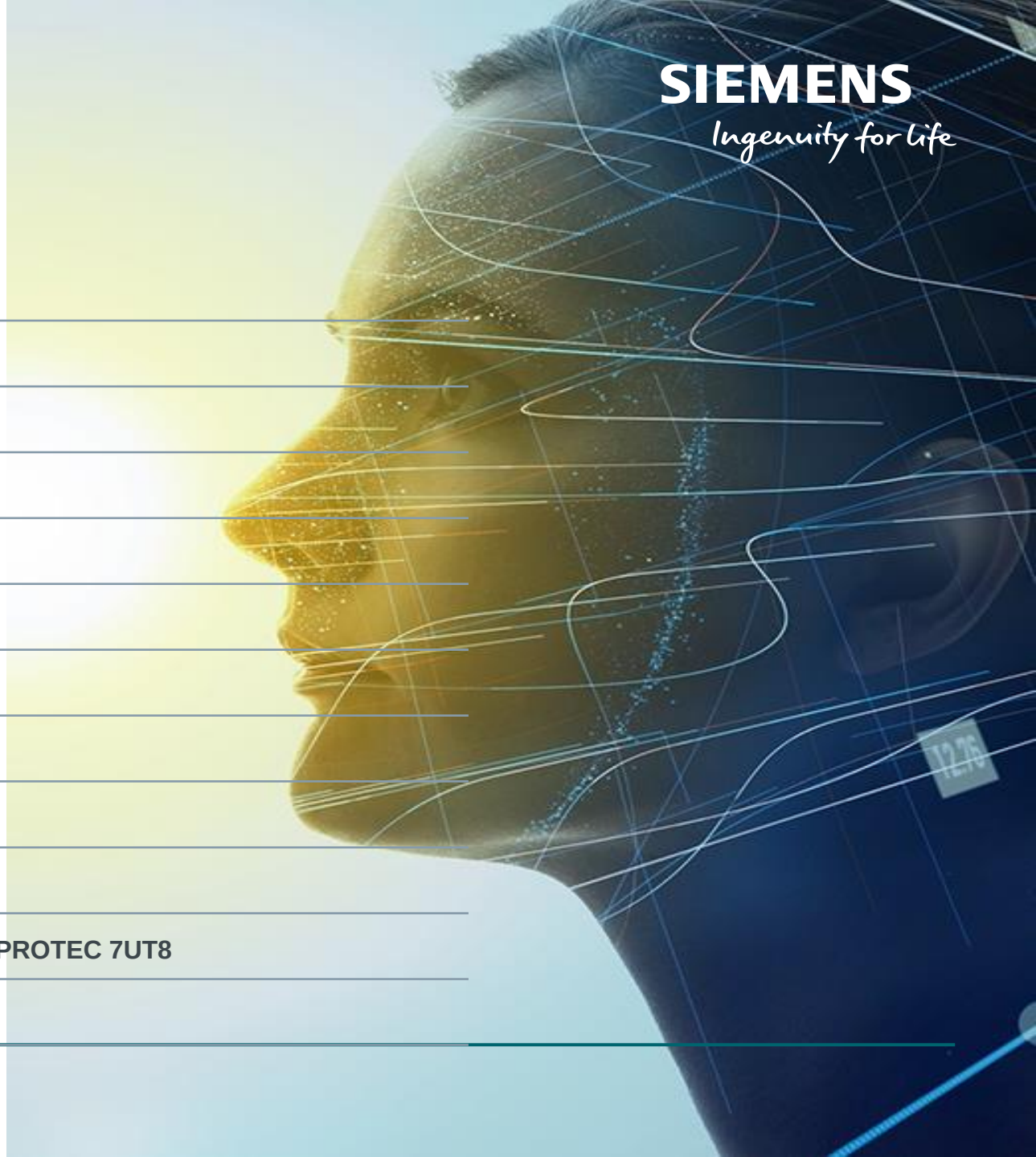
- Large impact with small investment
- Retrofittable in existing SIPROTEC 5 relays
- Protection of your asset investments
- Easily scalable to increase the protected areas.



point sensor

line sensor

Content



Control, protection and monitoring with SIPROTEC 7UT8 transformer protection

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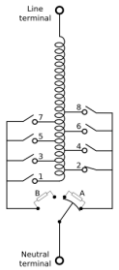


Logic for transformer cooling group control

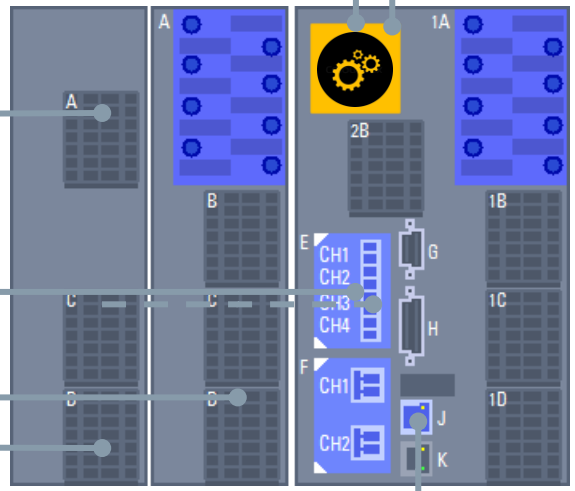
Automatic voltage regulator

Tap changer
position and control
digital or 4..20mA

Temperature sensors
4..20 mA

Buchholz relay
Trip and Alarm

Pressure relief devices



Temperature sensor
up to 12x PT100

TR1200 IP

Highlights

- Reduced investment
- One device for monitoring, control and protection
- Voltage regulation integrated
- Reduced wiring
- Faster commissioning

Content

Protection of motors in explosive environment (ATEX)

Certification of motor protection devices

- SIPROTEC 7SK82
- SIPROTEC 7SK85
- SIPROTEC 7UM85

for installing in explosive environment according the standard EN 60079-14 or the standard VDE 0165, part 1 (electric equipment for hazardous areas)

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