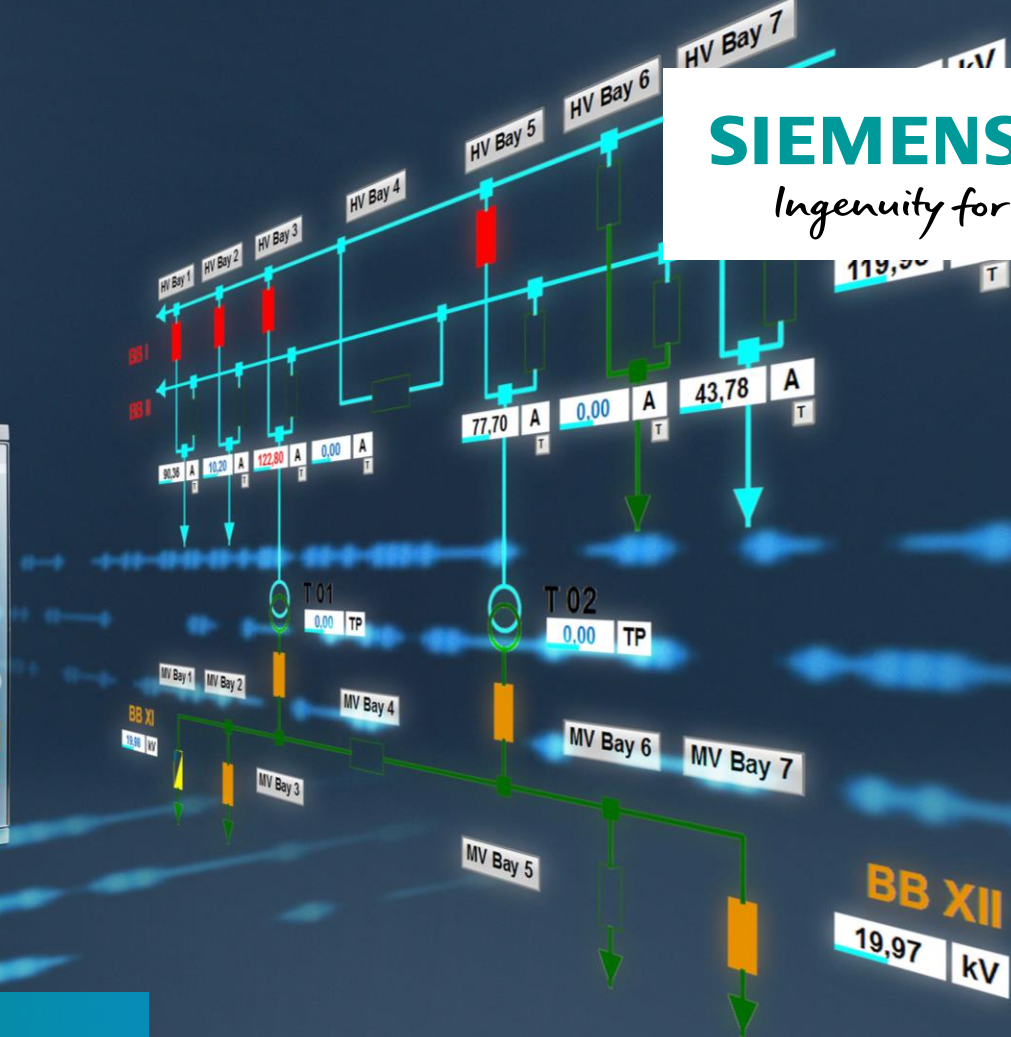


SIEMENS
Ingenuity for life



Protection news

Substation Automation & Protection brugermøde 2020

Unrestricted © Siemens 2020

[siemens.com/digital-grid](https://www.siemens.com/digital-grid)

Indholdsfortegnelse



- Protection news – DIGSI/SIPROTEC V.8.30
- SICAM GridEdge
- *Power Quality & Reyrolle have own presentations*

Protection news

DIGSI/SIPROTEC V.8.30

SIPROTEC 5 –

The benchmark for protection, automation and monitoring



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

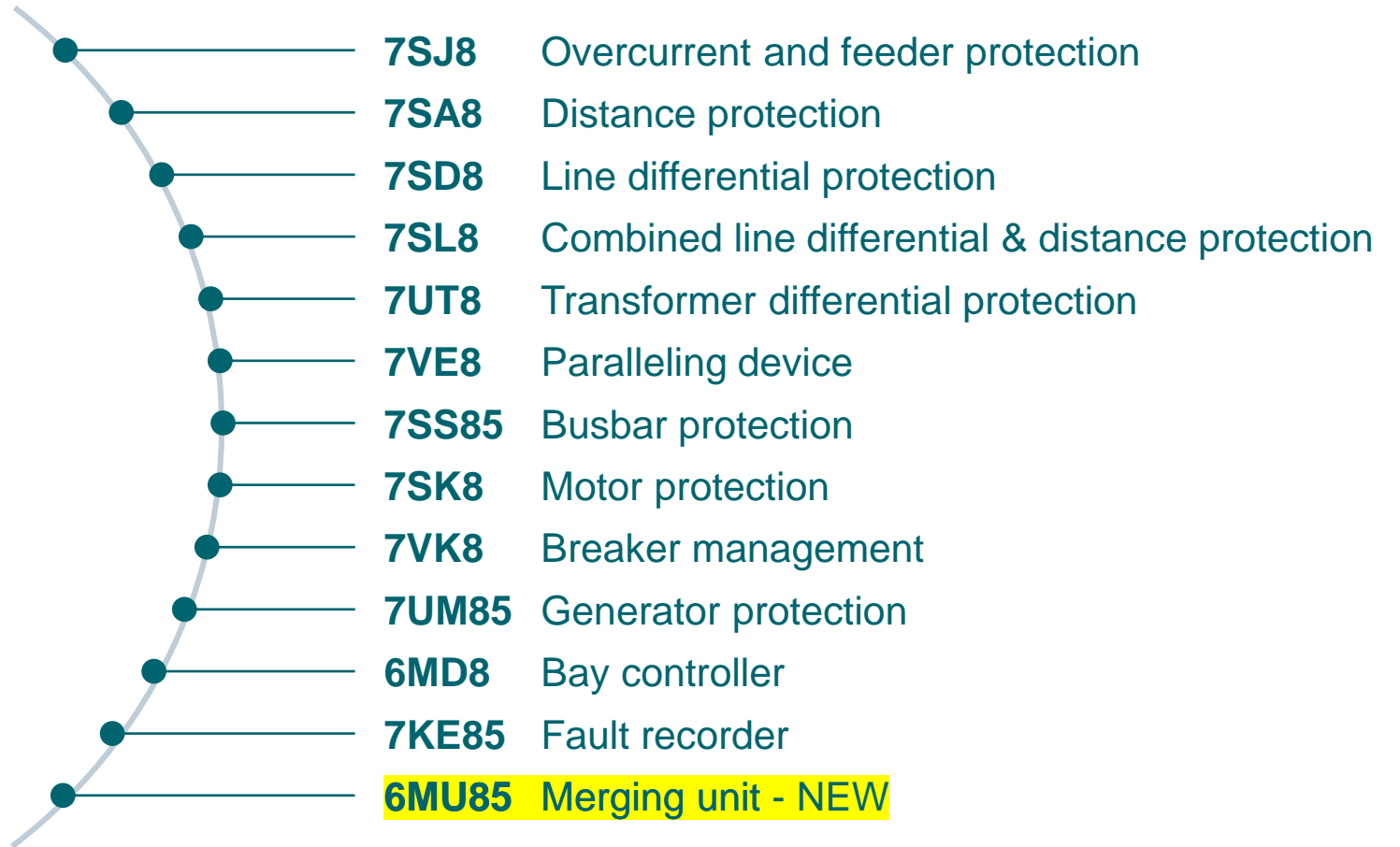
Consistent system and device engineering –
Efficient operating concepts, flexible engineering



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

SIPROTEC 5 relays

Proven solution for all applications



Easy engineering and evaluation – DIGSI and SIGRA

1 Operation and user experience

2 Designed to communicate

3 Safety and security inside

4 Strong in industrial applications

5 Redundant Power Supply

SIPROTEC 5

Operation and user experience

Release V08.30

1 Operation and user experience

1.1 Handling and engineering

1.2 Operation

1.3 Retrofit of 3rd party PMUs with SIPROTEC 5 PMUs

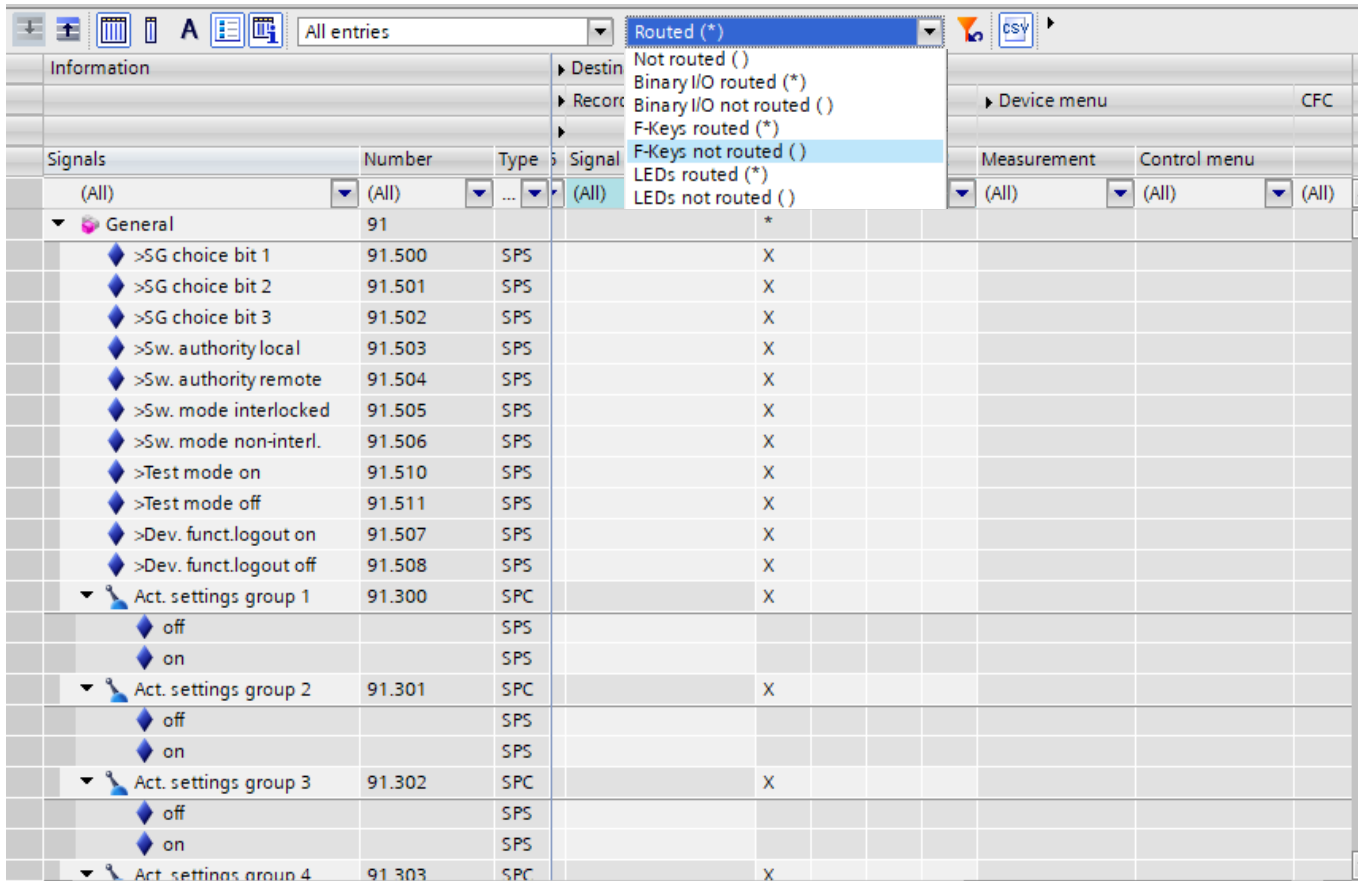
2 Designed to communicate

3 Safety and security inside

4 Strong in industrial applications

5 Redundant Power Supply

NEW: Easier filtering of routing information



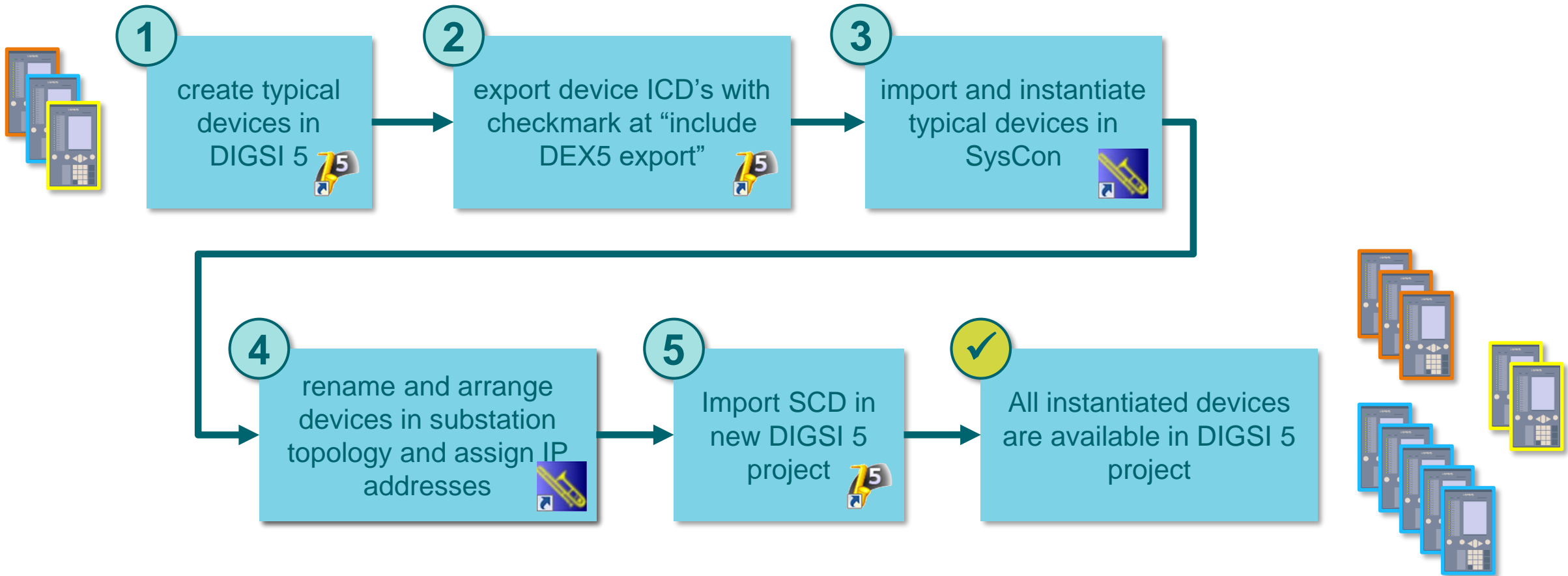
The screenshot shows a software interface with a table of routing information. A dropdown menu is open over the 'Signal' column, showing various filter options. The table lists signals under a 'General' group, including SPS signals and SPC settings groups. The 'Signal' column has a filter dropdown set to 'Routed (*)'. The table columns are: Signals, Number, Type, Signal, and several empty columns.

Signals	Number	Type	Signal						
(All)	(All)	...	(All)						
▼ General	91			*					
>SG choice bit 1	91.500	SPS		X					
>SG choice bit 2	91.501	SPS		X					
>SG choice bit 3	91.502	SPS		X					
>Sw. authority local	91.503	SPS		X					
>Sw. authority remote	91.504	SPS		X					
>Sw. mode interlocked	91.505	SPS		X					
>Sw. mode non-interl.	91.506	SPS		X					
>Test mode on	91.510	SPS		X					
>Test mode off	91.511	SPS		X					
>Dev. funct.logout on	91.507	SPS		X					
>Dev. funct.logout off	91.508	SPS		X					
▼ Act. settings group 1	91.300	SPC		X					
off		SPS							
on		SPS							
▼ Act. settings group 2	91.301	SPC		X					
off		SPS							
on		SPS							
▼ Act. settings group 3	91.302	SPC		X					
off		SPS							
on		SPS							
▼ Act. settings group 4	91.303	SPC		X					

Simplify complexity

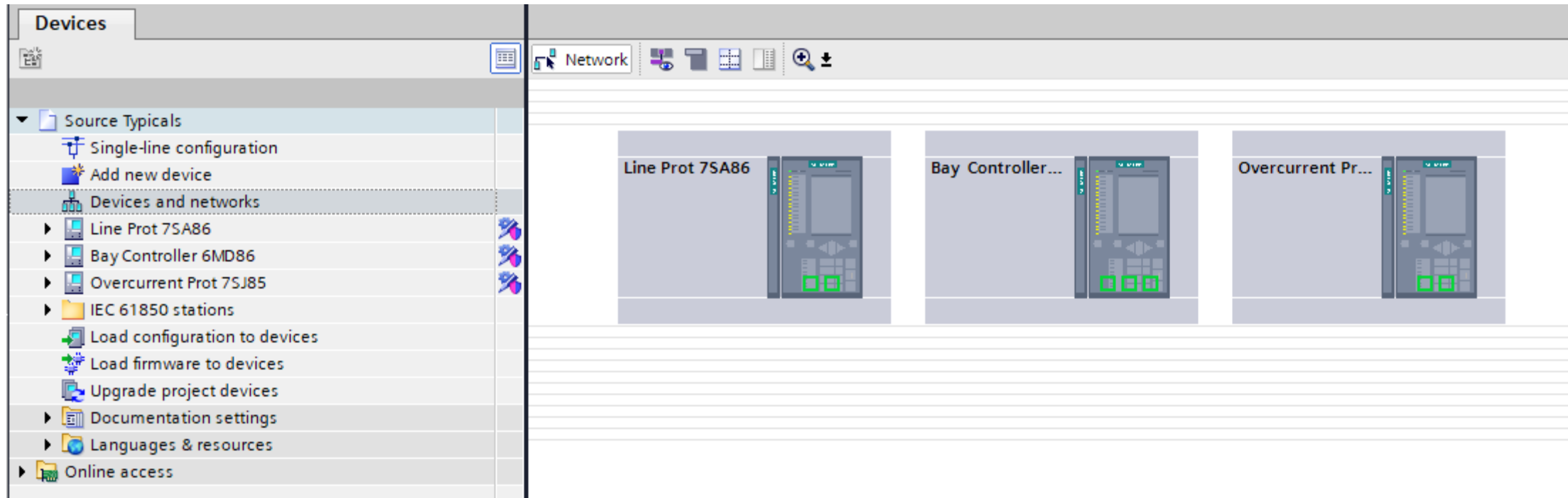
- Routing filter to your needs
- Binary inputs, F-Keys and LEDs

NEW: Automated IEC 61850 engineering with bay typicals



Automated Engineering with Bay Typicals

Step 1: Create Typical Devices in DIGSI 5



Automated Engineering with Bay Typical

Step 2: Export Device ICDs including DEX

Export

Source Typical/Line Prot 7SA86

Data formats:

- UAT - User-defined application template
- IEC 61850 data formats:*
 - ICD - IED Capability Description**
 - IID - Instantiated IED Description
 - MICS - Model Implementation Conformance Statement
- Protocol-related data formats:*
 - DIGT103 - IEC 60870-5-103 protocol settings for SICAM PAS
 - DIGDNP - DNP3 protocol settings for SICAM PAS

File: C:\UserData\WachelTemp\Automated Typical Engineering\Siprotec_Line Prot 7SA86

Comment:

▼ Export contents

Edition to export

SCL_2007B4

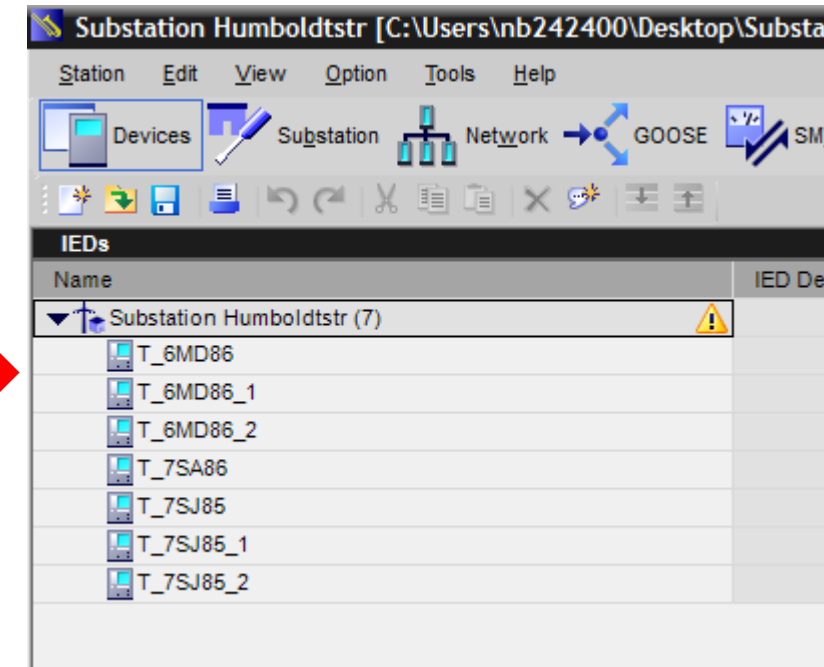
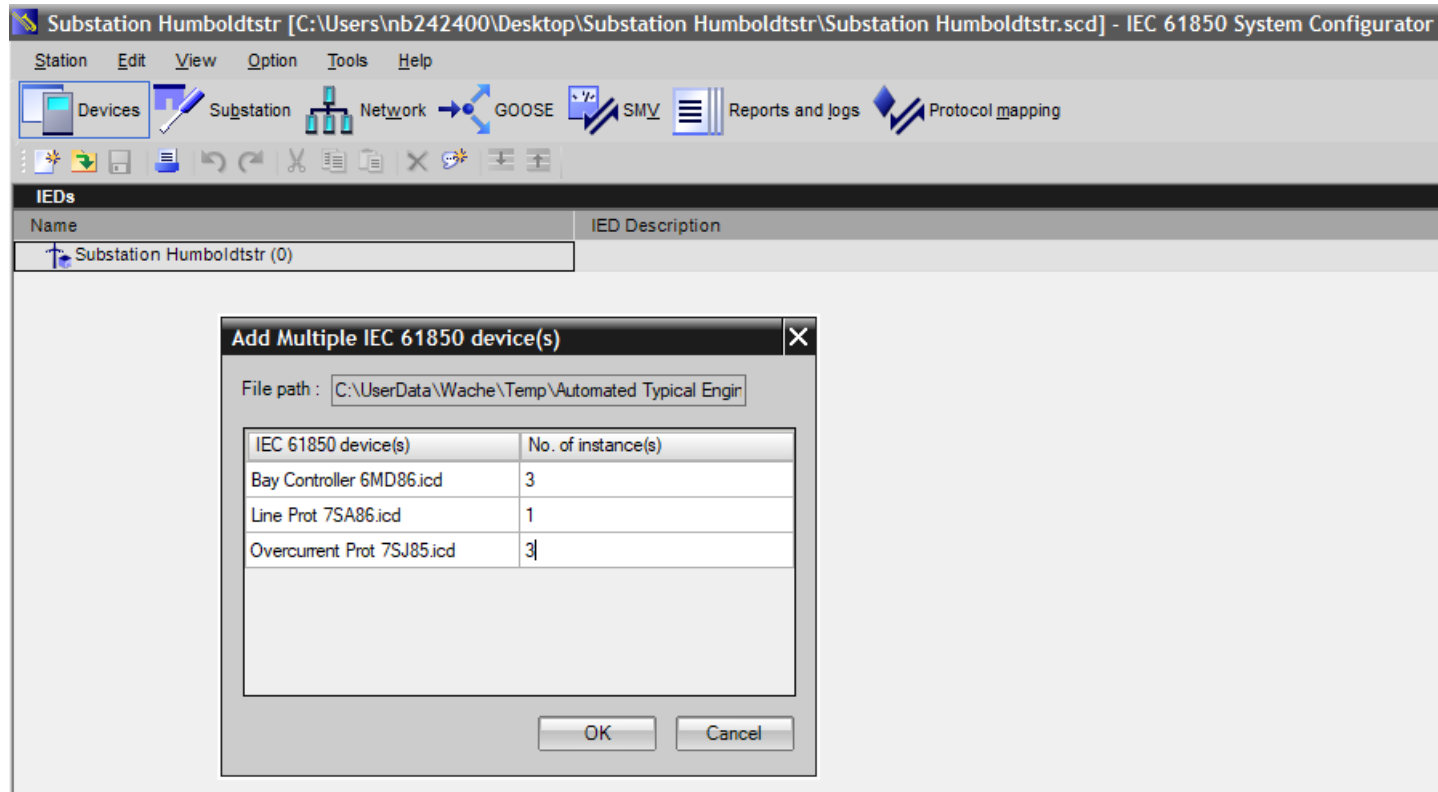
☒ Include DEX5 Export

File: C:\UserData\WachelTemp\Automated Typic

Export Cancel

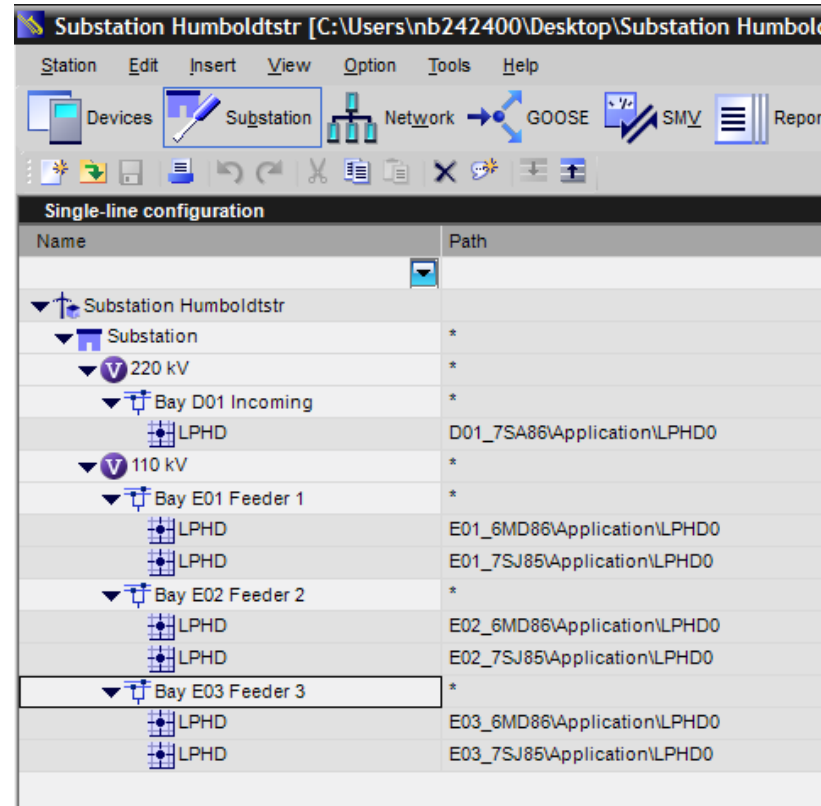
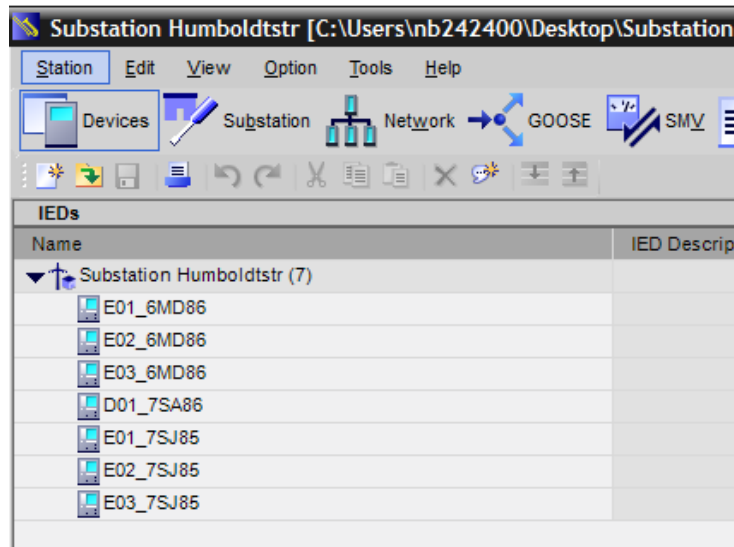
Automated Engineering with Bay Typical

Step 3: Import and instantiate Typical devices in Syscon



Automated Engineering with Bay Typical

Step 4: Rename, arrange devices in substation topology and assign IP addresses



Substation Humboldtstr [C:\Users\nb242400\Desktop\Substation Humboldtstr]

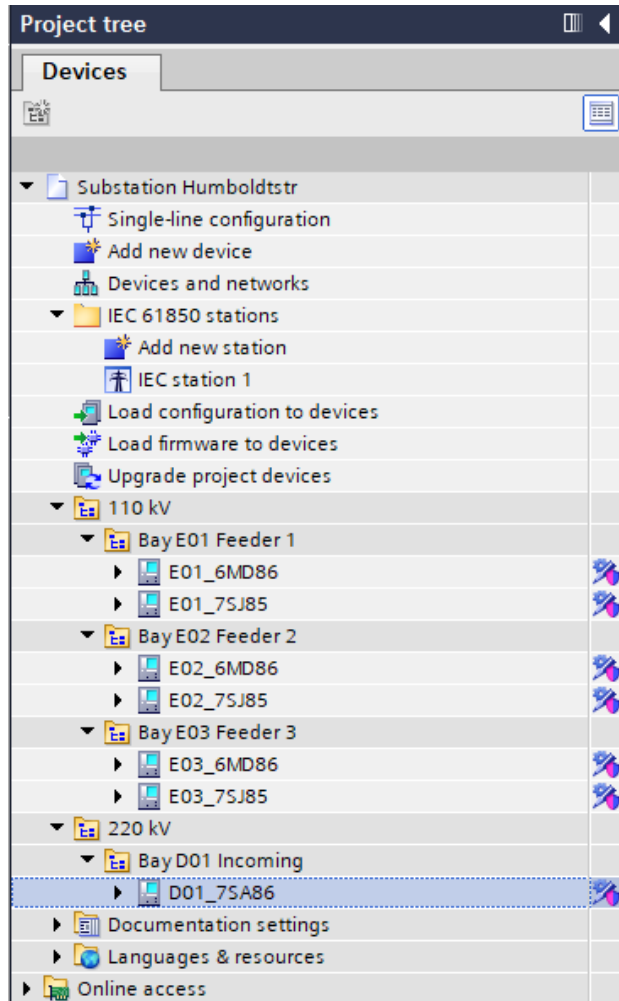
Station Edit Insert View Option Tools Help

Devices Substation Network GOOSE SMV Reports and Settings

Subnets		
Name	IED Description	IP address
Substation Humboldtstr		
New devices		
Default_subnet		
E01_6MD86/F		10.16.60.60
E02_6MD86/F		10.16.60.61
E03_6MD86/F		10.16.60.62
D01_7SA86/F		10.16.60.63
E01_7SJ85/F		10.16.60.64
E02_7SJ85/F		10.16.60.65
E03_7SJ85/F		10.16.60.66

→ Export SCD

Automated Engineering with Bay Typical



Step 5: Import SCD in new DIGSI 5 project.

Result: Have all instantiated devices available in DIGSI 5 project.

Further helpful support for typical engineering by DIGSI 5 (available before V8.30)



Flexible adaptation to customer requirements

- Flexible Engineering IEC61850

Reduce number of typicals

- Use CFC plan in plan (CFC macro)
- Activate / Deactivate Function Groups (Function Group Mode „off“)

Easy typical engineering

- Copy Userdefined Application Templates also between different device types

Simple and easy adaptation of typicals

- Favourite settings to summarize the variables of typicals

Favourite settings

Test V8.30 ▶ E01_6MD86 ▶ Settings ▶ VI 3ph 1 ▶ General

Edit mode: secondary Active: settings group 1

General

Rated values

821.9451.101	Rated current:	<input type="text" value="1000"/>	A		
821.9451.102	Rated voltage:	<input type="text" value="400.00"/>	kV		
821.9451.103	Rated apparent power:	<input type="text" value="692.82"/>	MVA		

Power-system data

821.9451.149	Power-sys. neutral point:	<input type="text" value="grounded"/>		
--------------	---------------------------	---------------------------------------	--	--

Measurements

821.9451.158	P, Q sign:	<input type="text" value="not reversed"/>		
--------------	------------	---	--	--

- Most settings can be marked as „favourite setting“
- All favourite settings appear under a summary menu entry (see next page)

Favourite settings

Goal:
Better overview on
relevant settings

The screenshot displays the Siemens SPS Manager software interface. On the left, a tree view under 'Devices' shows the project 'Test V8.30' expanded to 'E01_6MD86'. The 'Settings' folder is expanded, and the 'Favorite settings' option, marked with a yellow star, is highlighted with a red rectangle. The main panel on the right shows the configuration for 'Power system General'. It includes a table with IP addresses and phase sequence settings, and a section for 'QA1->25 Synchronization Synchrocheck 1' with 'General' settings like 'Min. operating limit Vmin' and 'Voltage adjustment'. Below this, the 'VI 3ph 1 General' section shows 'Rated values' for 'QA1', 'QB1', 'QB2', and 'QB9', including 'Rated current' and 'Rated voltage'.

IP Address	Phase sequence	Star Icon
11.2311.101	ABC	★

IP Address	Min. operating limit Vmin	Unit	Star Icon
201.1151.5071.101	90.000	V	★
201.1151.5071.126	1.000		★

Device	Rated current	Unit	Star Icon
821.9451.101	1000	A	★
821.9451.102	400.00	kV	★

Print: Show condensed information about configured protection functions



E01_6MD86

Device information

Device details	
Name	Value
Name	E01_6MD86
IEC 61850 name	SIP
IEC 61850 Edition	IEC 61850 Edition 2.1
Type	6MD86
Serial number	
Configuration version	V08.30.00
Communication configuration version	V08.30.00
Product code	6MD86-????-???-?????-?M01?2-231?3B-AAA000-000AC0-CB3BA1-CG0
Short product code	
CPU type	CP300

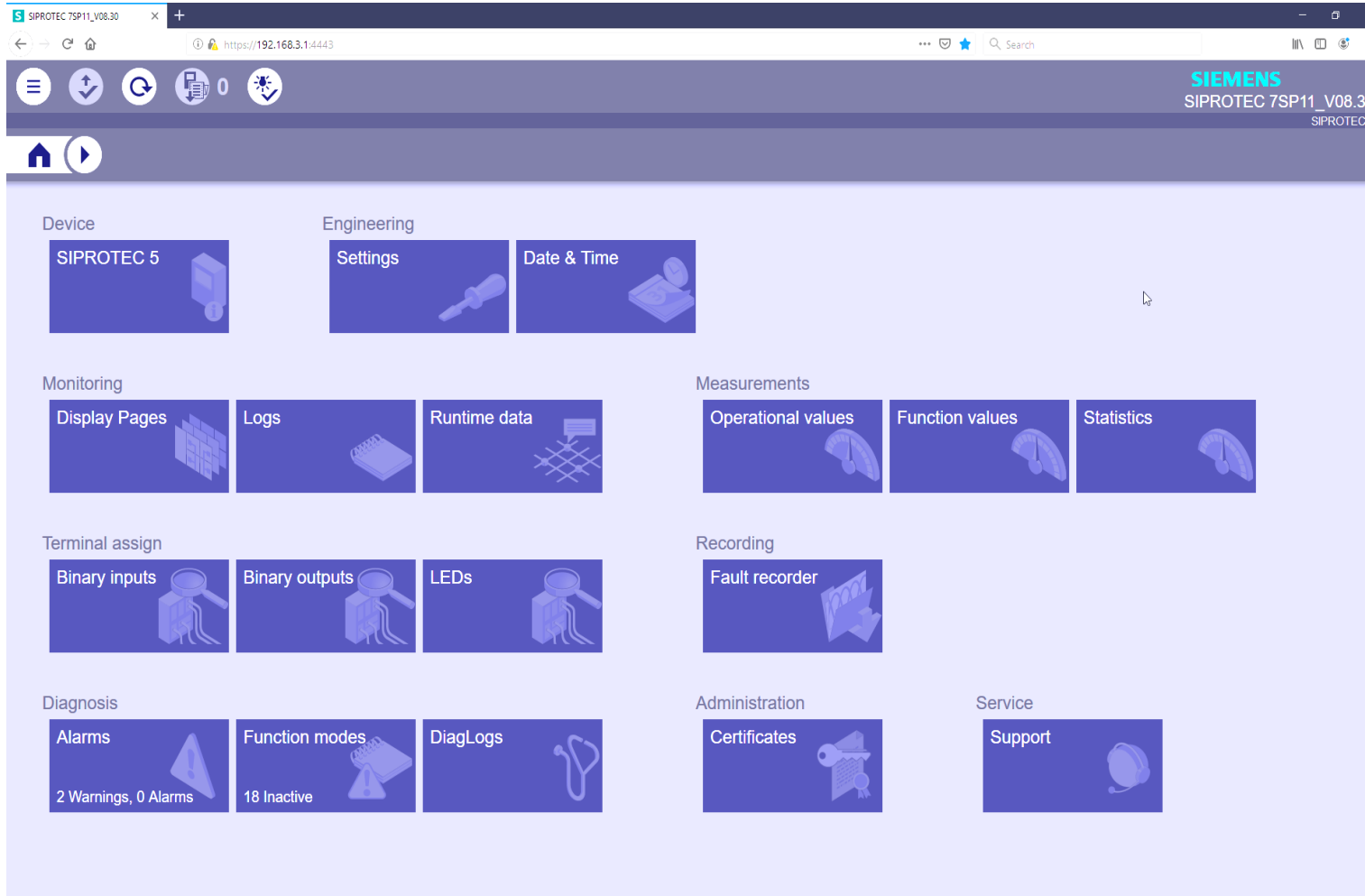
Condensed information about configured protection functions.

VI 3ph 1	
Name	Value
50/51 OC-3ph-A1	Settings group 1: off
VI 1ph 1	
Name	Value
81 Overfreq.-A 1	Settings group 1: off

List of configured protection functions per function group

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

SIEMENS
Ingenuity for life

Fault number	File Name	Trigger Date	Trigger Time	State
1	FRA00001	2019-03-27	08:57:10.709	Downloaded
2	FRA00002	2019-03-27	14:25:29.669	Downloaded
3	FRA00003	2019-03-27	14:31:30.661	New

Date	Time	Functions structure	Name	Value
18.04.2018	16:39:59.891	Circuit breaker 1	74TC sup.1Bl 1:Trip-circuit failure	on
18.04.2018	16:35:10.077	VI 1ph 1:Rotor gnd. fault -I 1	General:Failure RGF frated	on
18.04.2018	16:35:03.369	E:ETH-BA-2EL:Channel 1	Line Mode:Redund. Channel Live	on
18.04.2018	16:35:03.346	E:ETH-BA-2EL:Channel 1	Line Mode:Channel Live	on
18.04.2018	16:35:00.088	Generator stator:SGF 90% MP-1ph 1	General:Health	ok
18.04.2018	16:35:00.079	Generator stator:81 Underfreq.-A 1	General:Undervoltage blocking	on
18.04.2018	16:35:00.079	Generator stator:81 Overfreq.-A 1	General:Undervoltage blocking	on
18.04.2018	16:35:00.079	Generator stator:32R Revers.pow. 1	General:Undervoltage blocking	on
18.04.2018	16:35:00.079	Generator stator:SGF 90% MP-1ph 1	General:Health	alarm
18.04.2018	16:34:59.919	Recording	Grnd.-fit log:Fault number	0

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

[illegible]

Overview	Application Diagnostic > IEEE 1588			
Health	PTP General			
Module Info	PTP enable	Yes		
Network Status	PTP profile	IEC 61850-9-3:2016		
Application Diagnosis	Transport protocol	Layer 2 Multicast		
Network Protocols	VLAN tag	Not Support		
IEEE 1588	Clock type	Ordinary clock		
SNTP	Slave only	Yes		
Communication Protocols	Slave Clock			
IEC61850	General			
IEC61850 - GOOSE	Clock ID	B4:B1:5A:FF:FE:09:B5:46		
PB-MU	Domain number	0		
	Path delay mechanism	Peer-to-Peer		
	P2P request interval	1	seconds	
	Announce receipt timeout	3	seconds	
	Steps	2		
	Servo status	Locked		
	Channel live states	On		
		CH1	CH2	
	Port state	SLAVE	---	
	Offset	-36	+0	nanoseconds
	Mean path delay	1411	0	nanoseconds
	Current Master Clock Info			
		CH1	CH2	
	Clock ID	94:B8:C5:FF:FE:6A:61:40	---	
	Port number	1	0	
	Steps	2	0	
	Domain number	0	0	
	GM priority1	128	0	
	GM priority2	128	0	
	GM clock class	248	0	
	GM clock accuracy	47	0	
	GM clock ID	94:B8:C5:FF:FE:6A:61:40	---	
	Current UTC offset	37	0	seconds
	CurrentUtcOffsetValid	True	---	
	Traceable	False	---	

Easy and fast access to detailed communication status

1 Operation and user experience

1.1 Handling and engineering

1.2 Operation

1.3 Retrofit of 3rd party PMUs with SIPROTEC 5 PMUs

2 Designed to communicate

3 Safety and security inside

4 Strong in industrial applications

5 Redundant Power Supply

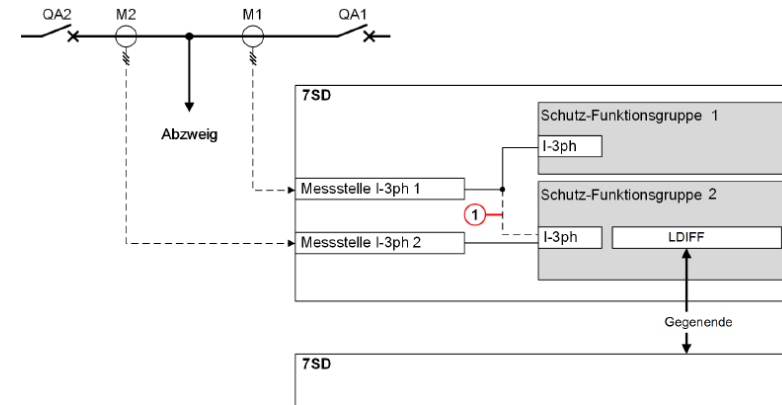
NEW: Measuring point disconnection functionality

Simplified maintenance, testing and operating

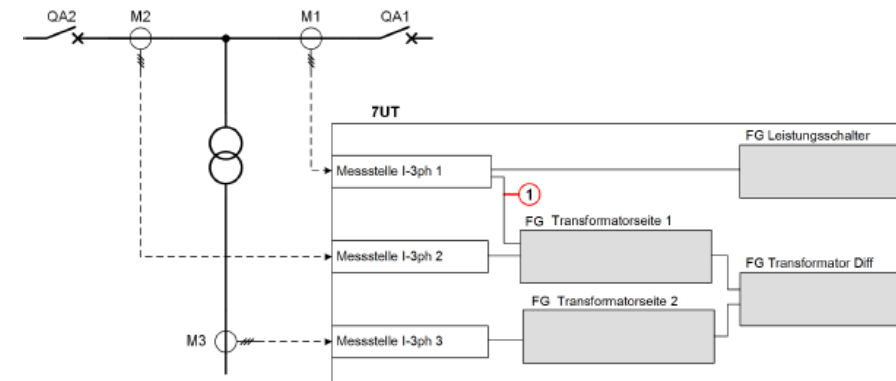
- Disconnection of individual 3ph current measuring points from the processing of the protection system
- No physical intervention on the terminals.
- Disconnection of the measuring point via binary input
- Avoids incorrect tripping of the connected protection function cause by current injection

- 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)

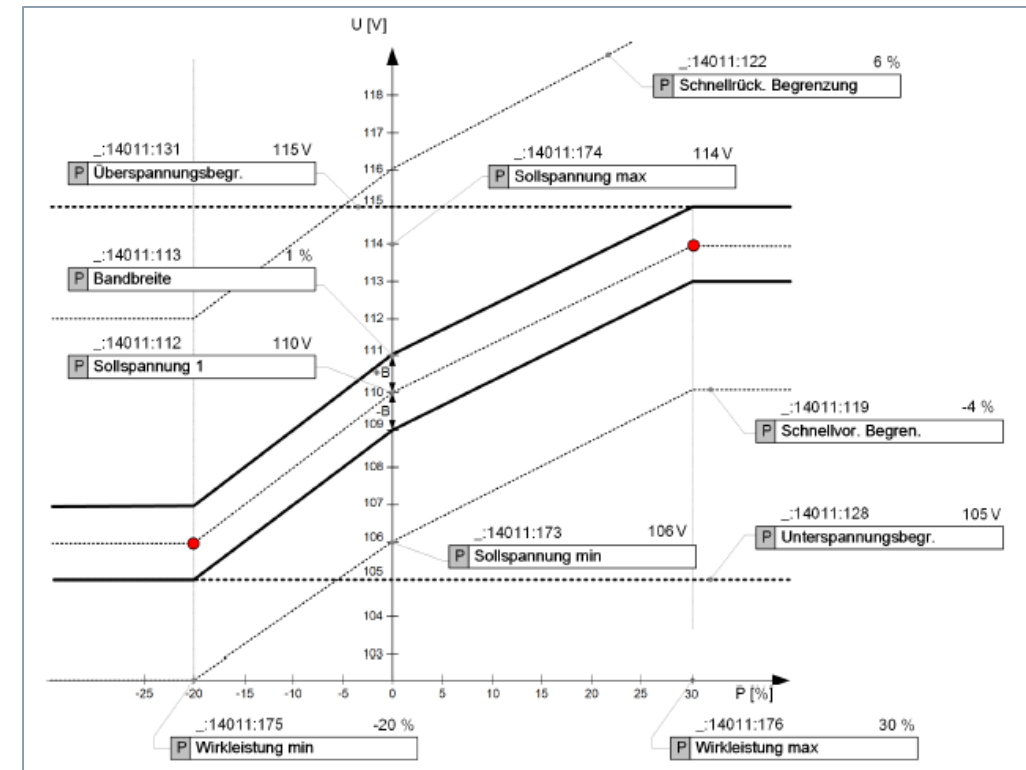


NEW: Dynamic voltage regulation (DVR)

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

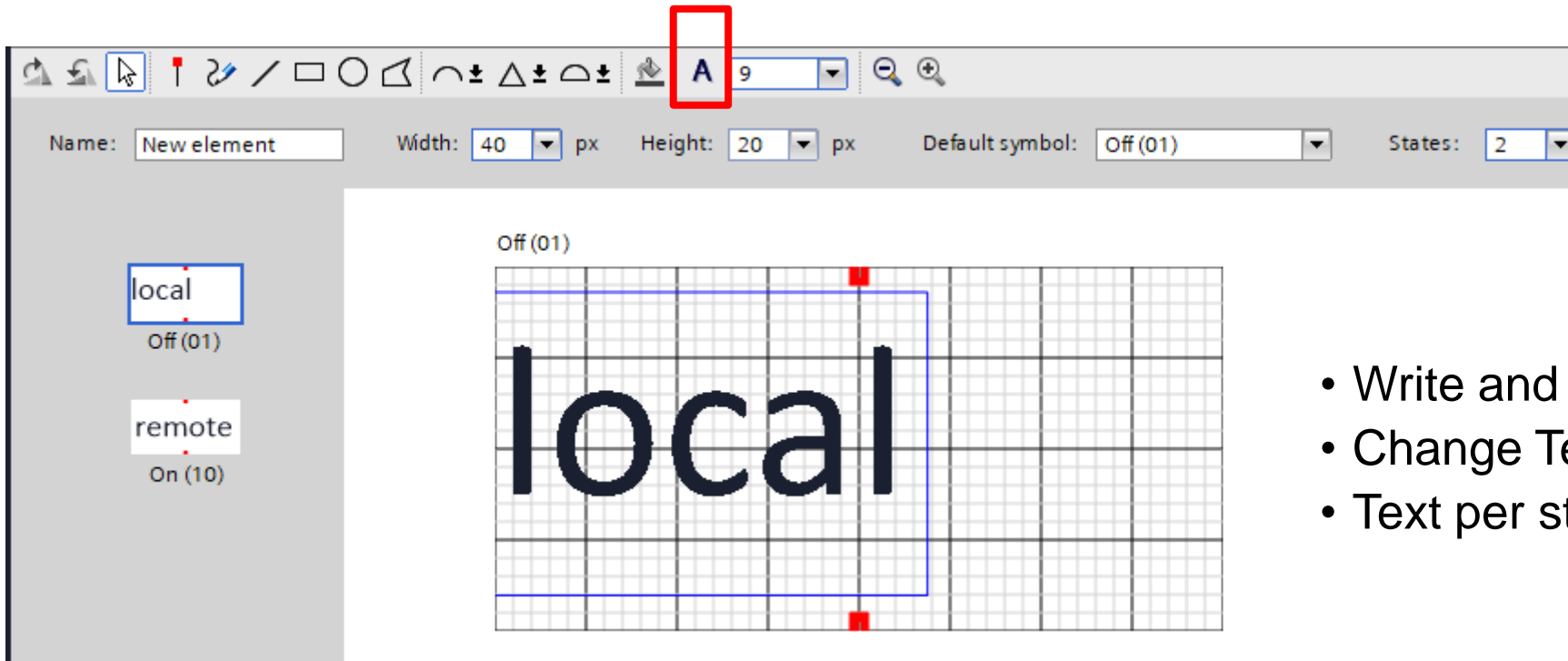
- Bidirectional power flow by decentralized feeders
- Overvoltages in the individual nodal points caused by strong decentralized infeeds
- Voltage limits according to the power quality standard DIN EN 50160 can be exceeded
- Dynamic voltage regulation (DVR) adapts the voltage setpoint of the voltage 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



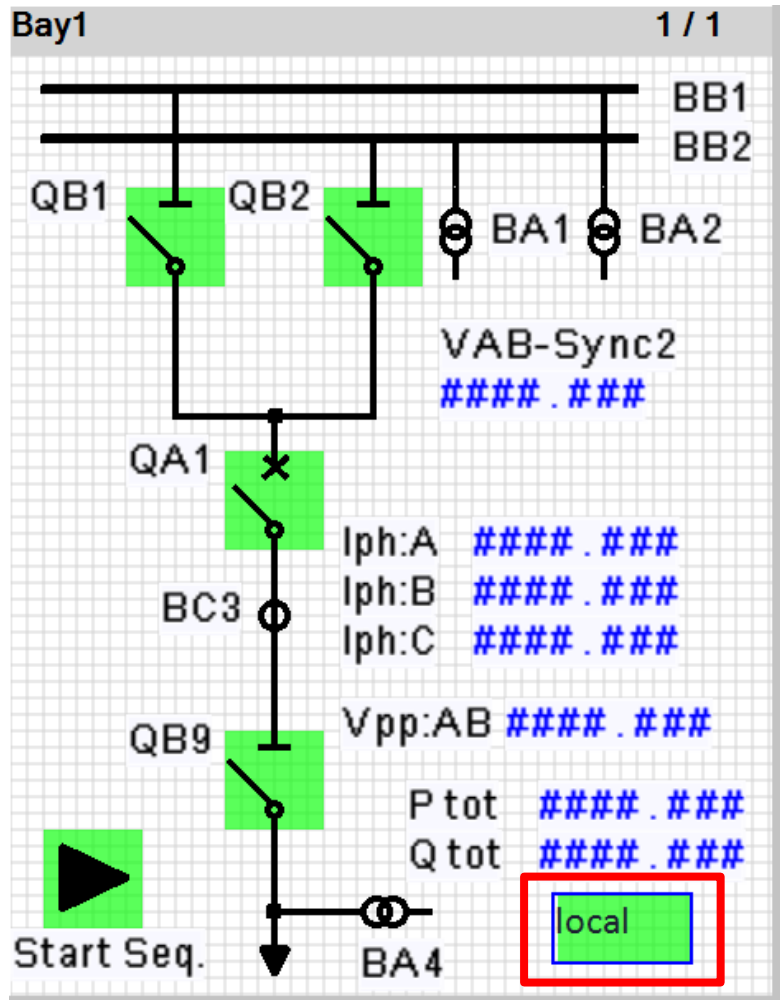
Text Tool in Symbol Editor

Accessible in Symbol Editor Menu



- Write and edit Text in symbol editor
- Change Text size
- Text per state can be different

Text Tool in Symbol editor



Text is displayed according to status
of connected signal

1 Operation and user experience

1.1 Handling and engineering

1.2 Operation

1.3 Retrofit of 3rd party PMUs with SIPROTEC 5 PMUs

2 Designed to communicate

3 Safety and security inside

4 Strong in industrial applications

Retrofit of 3rd party PMUs with SIPROTEC 5 PMUs

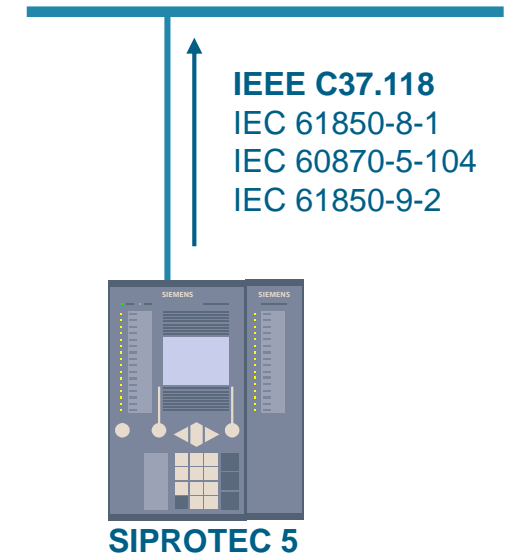
Easy adaption of SIPROTEC PMUs to existing interface requirements

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

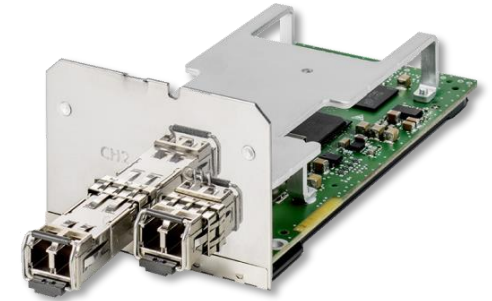
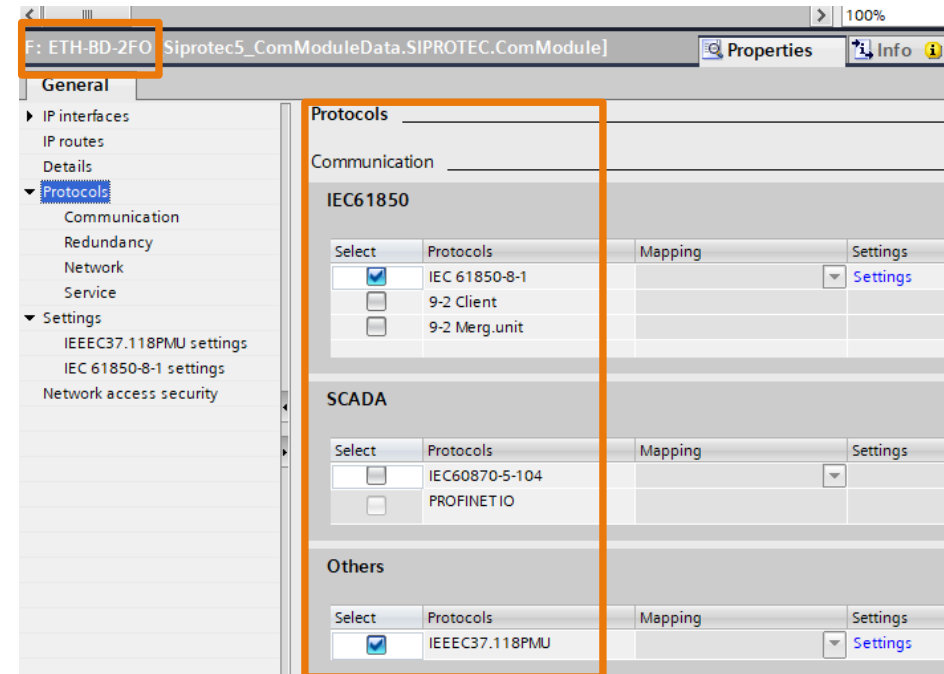
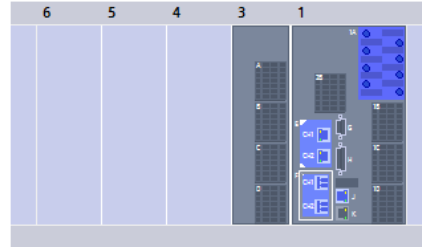


NEW: Multiple Ethernet protocols on the same module

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



SIPROTEC 5

Designed to communicate
Release V08.30

Unrestricted © Siemens 2020

[siemens.com/processbus](https://www.siemens.com/processbus)



1 Operation and user experience

2 Designed to communicate

2.3 Powerful and universal Ethernet module ETH-BD-2FO

3 Safety and security inside

4 Strong in industrial applications

5 Redundant Power Supply

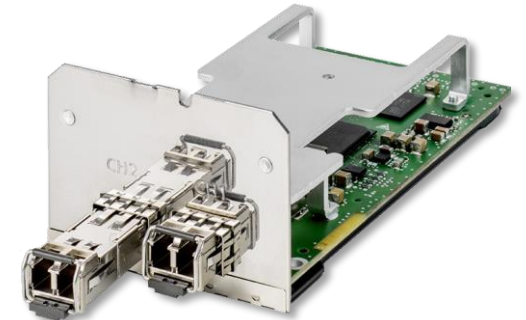
SIPROTEC 5

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



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



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

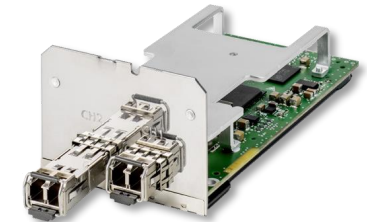
NEW: Additional protocols (Device DDD V8.30)

- 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

Connector type	2 x duplex LC
Wavelength	$\lambda = 1300 \text{ nm}$
Baud rate	100 Mbit/s
Max. line length	2 km for 62.5 µm/125 µm optical fibers



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

Optional SFP for the ETH-BD-2FO

as replacement of standard multimode SFP for 2 km



Optical SFP for up to 24 km		Electrical SFP for up to 20 m (not for sample synchronization)	
Order Code	P1Z3210 (pack of 10 units)	Order Code	P1Z3201 (pack of 10 units)
Connector type	2 x duplex LC	Connector type	RJ45
Wavelength	$\lambda = 1300\text{ nm}$	Baud rate	100 Mbit/s
Baud rate	100 Mbit/s	Protocol	See ETH-BD-2FO
Protocol	See ETH-BD-2FO	Max. line length	20 m with Ethernet patch cable CAT 6 S/FTP, F/FTP, or SF/FTP
Max. line length	24 km for 9 μm /125 μm optical fibers	Interface design	Corresponds to IEEE 802.3, 100Base-TX



Sample synchronization vs. time synchronization

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

	Sample and time synchronization	Time synchronization
Communication Plug-In Module	ETH-BD-2FO	ETH-BA-2EL ETH-BB-2FO
Applications	<ul style="list-style-type: none"> • Date and time synchronization • Sample synchronization for process bus • PMU data synchronization • 87L stabilization for unsymmetrical PI networks 	<ul style="list-style-type: none"> • Date and time synchronization
Type of implementation	Hardware / FPGA	Software
Accuracy	1 μ s 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

SIPROTEC 5

Strong in Safety and Security

Release V08.30

1 Operation and user experience

2 Designed to communicate

3 **Safety and security inside**

3.1 **Comprehensive cyber security features of SIPROTEC 5**

3.2 Authenticated network access IEEE 802.1X

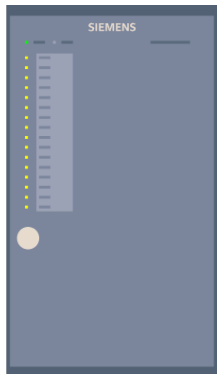
3.3 Virtual segregation of networks with VLAN IEEE 802.1Q

3.4 Conformal coating of electronic boards - harsh environments

4 Strong in industrial applications

5 Redundant Power Supply

Integrated cyber security



Trusted Partner



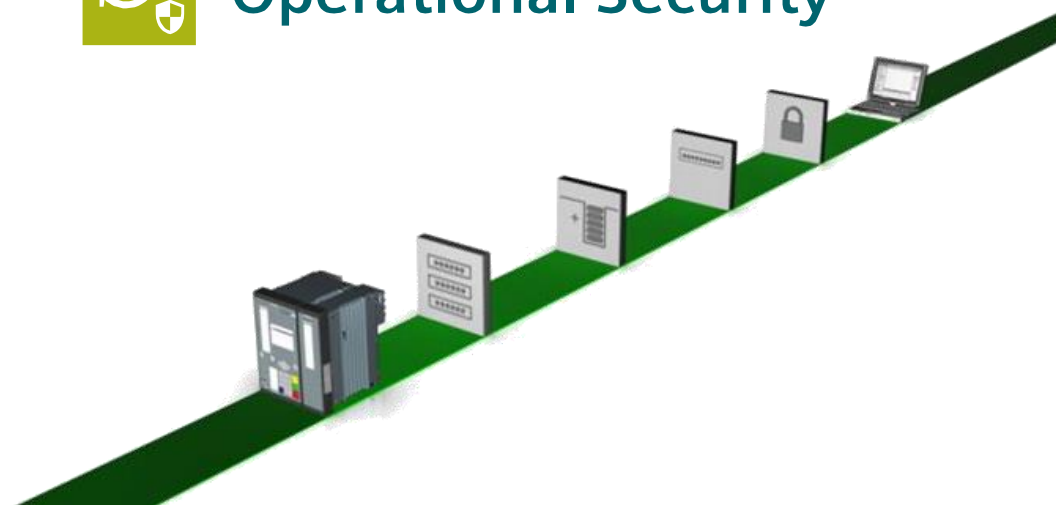
Product Security



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

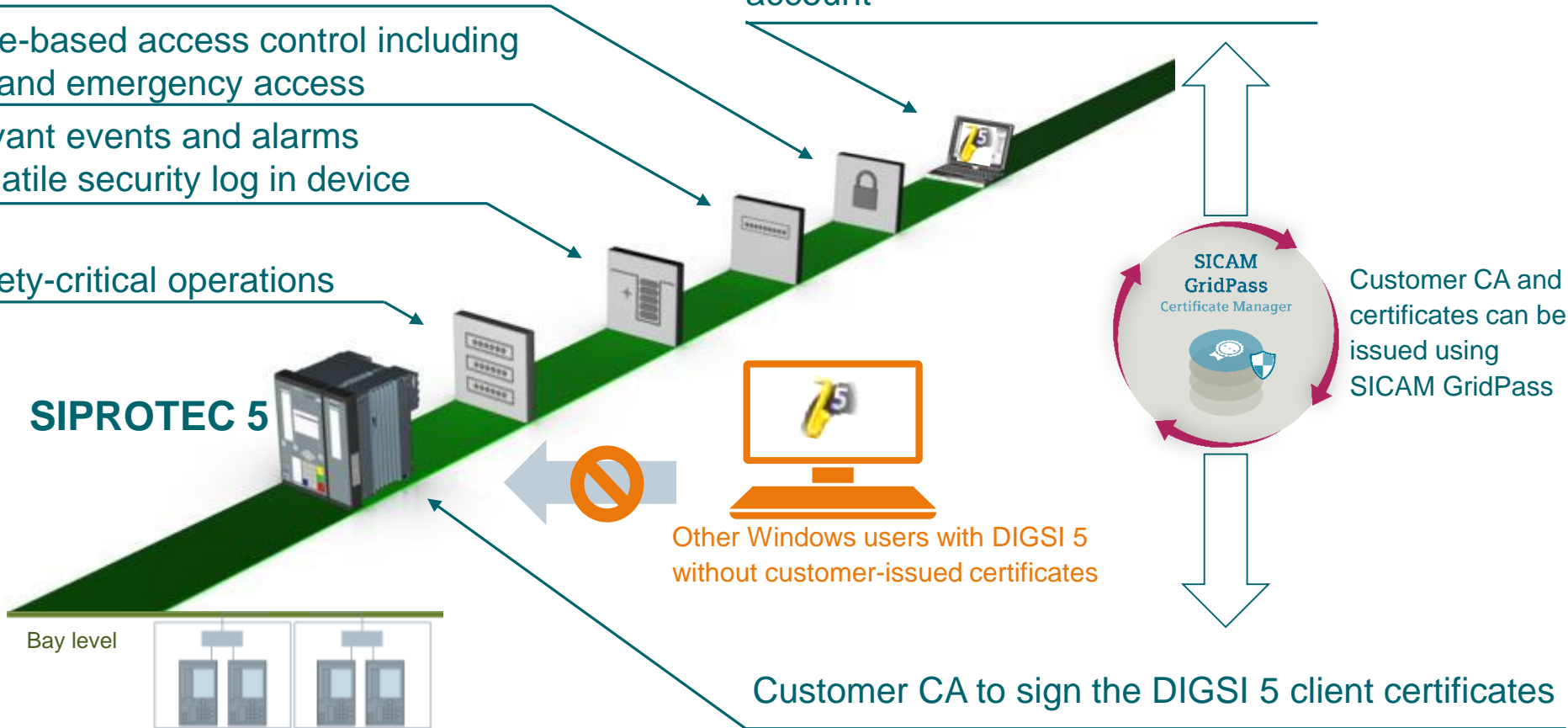


Mutually authenticated und encrypted communication between DIGSI 5 and the SIPROTEC 5 device
Only DIGSI 5 installations that connect using certificates signed by customer's CA are permitted

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



1 Operation and user experience

2 Designed to communicate

3 **Safety and security inside**

3.1 Comprehensive cyber security features of SIPROTEC 5

3.2 **Authenticated network access IEEE 802.1X**

3.3 Virtual segregation of networks with VLAN IEEE 802.1Q

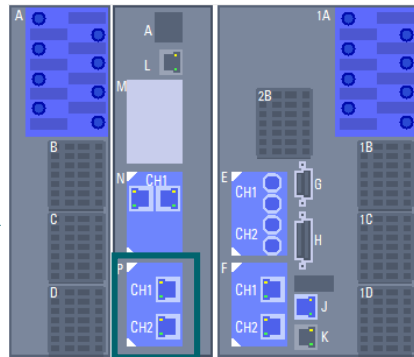
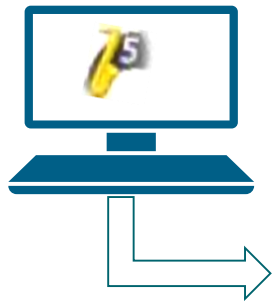
3.4 Conformal coating of electronic boards - harsh environments

4 Strong in industrial applications

5 Redundant Power Supply

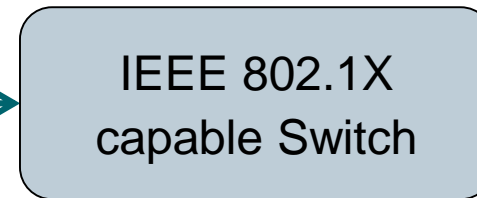
NEW: Authenticated Network Access IEEE 802.1X

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



Line mode, not in Ring mode

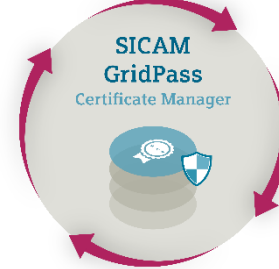
2. During bootup, the device's COM module presents the client certificate for authentication to the switch using IEEE 802.1X



Other products without customer-issued IEEE 802.1x client certificates

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

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



RADIUS Server

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

NEW: Authenticated Network Access IEEE 802.1X



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

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
- Tunnelled communication in between network devices that provides confidentiality
- Centrally manage access credentials using Radius Server



1 Operation and user experience

2 Designed to communicate

3 **Safety and security inside**

3.1 Comprehensive cyber security features of SIPROTEC 5

3.2 Authenticated network access IEEE 802.1X

3.3 **Virtual segregation of networks with VLAN IEEE 802.1Q**

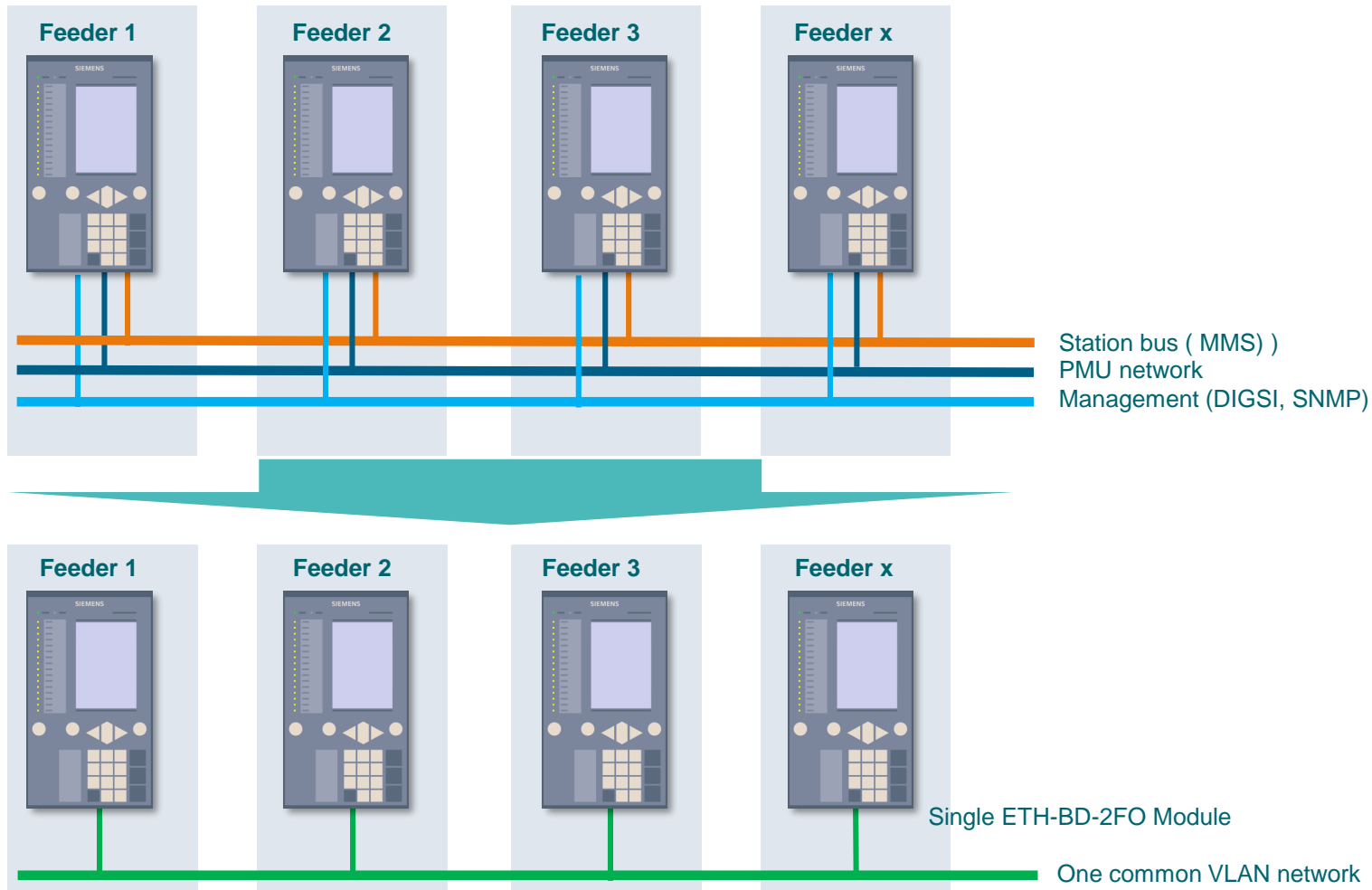
3.4 Conformal coating of electronic boards - harsh environments

4 Strong in industrial applications

5 Redundant Power Supply

Network architectures VLAN

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

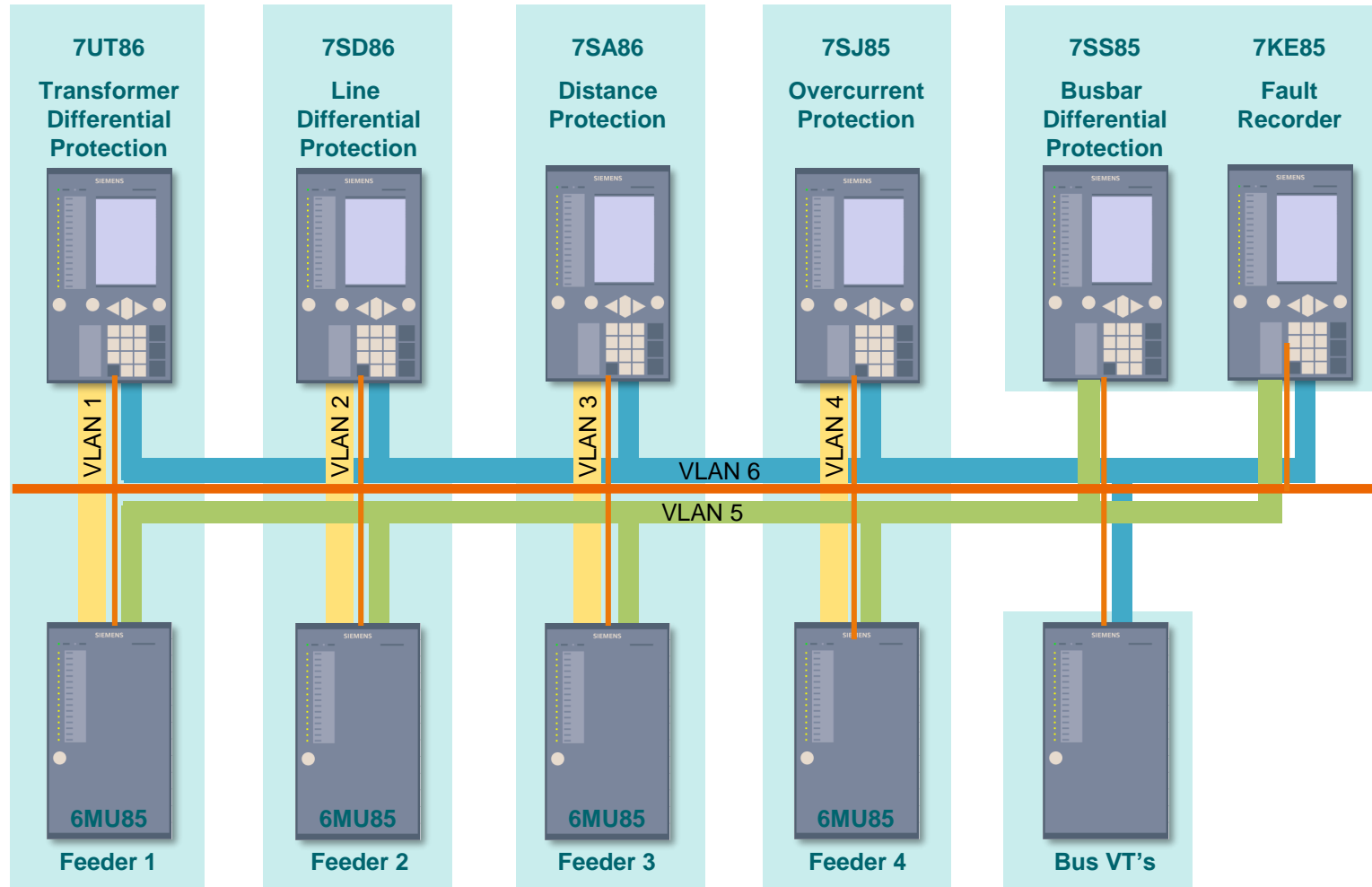


Simplify your network

- 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

1 Operation and user experience

2 Designed to communicate

3 **Safety and security inside**

3.1 Comprehensive cyber security features of SIPROTEC 5

3.2 Authenticated network access IEEE 802.1X

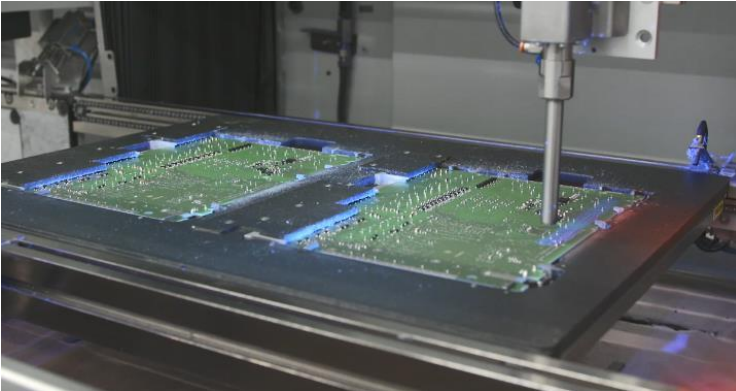
3.3 Virtual segregation of networks with VLAN IEEE 802.1Q

3.4 **Conformal coating of electronic boards - harsh environments**

4 Strong in industrial applications

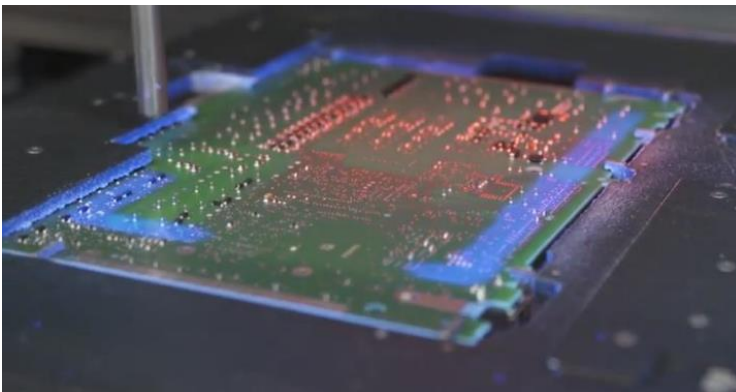
5 Redundant Power Supply

Conformal coating as standard – Maximum lifetime under extreme industrial conditions



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

SIPROTEC 5

Strong in industrial application

Release V08.30

1 Operation and user experience

2 Designed to communicate

3 Safety and security inside

4 **Strong in industrial applications**

4.1 Protection of 400 V grids

4.2 Distributed busbar protection as extension of existing feeder protection

4.3 Control, protection and monitoring with transformer protection SIPROTEC 7UT8

4.4 Protection of motors in explosive environment

5 Redundant Power Supply

1 Operation and user experience

2 Designed to communicate

3 Safety and security inside

4 **Strong in industrial applications**

4.1 **Protection of 400 V grids**

4.2 Distributed busbar protection as extension of existing feeder protection

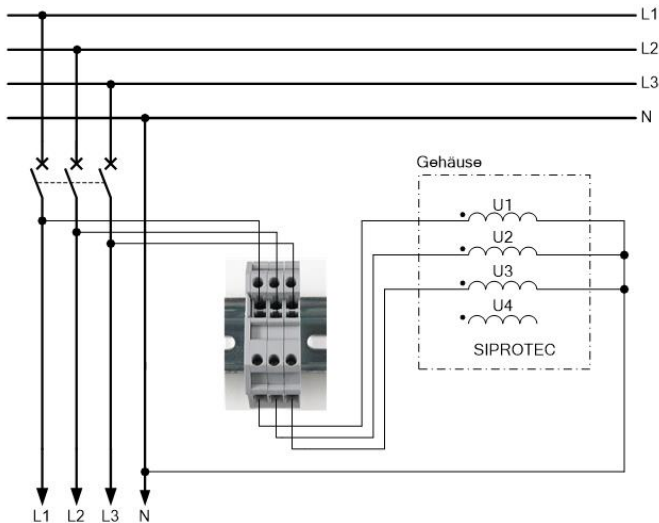
4.3 Control, protection and monitoring with transformer protection SIPROTEC 7UT8

4.4 Protection of motors in explosive environment

5 Redundant Power Supply

Protection of 400 V grids with SIPROTEC 5 multifunction relays

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



1 Operation and user experience

2 Designed to communicate

3 Safety and security inside

4 **Strong in industrial applications**

4.1 Protection of 400 V grids

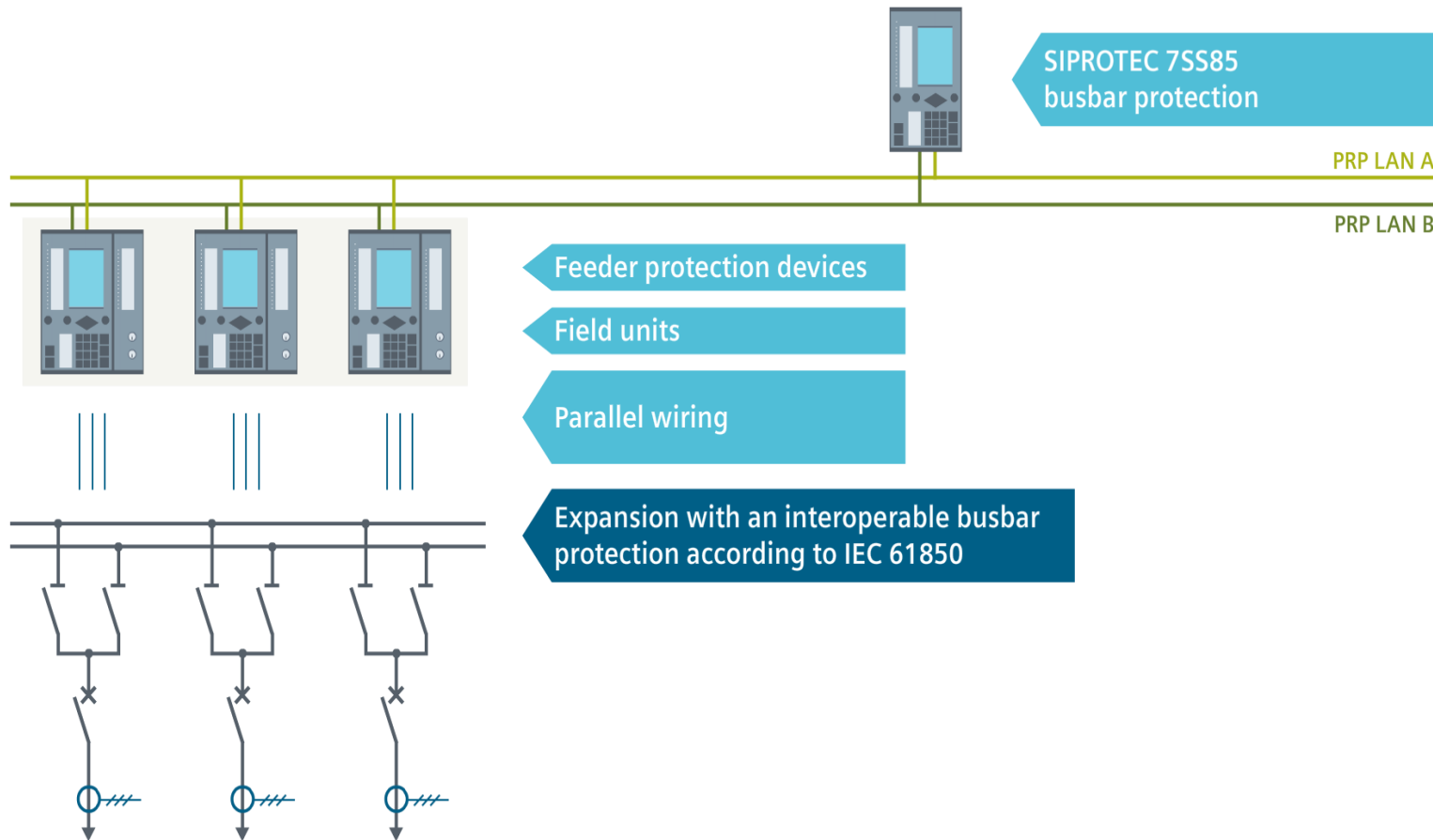
4.2 **Distributed busbar protection as extension of existing feeder protection**

4.3 Control, protection and monitoring with transformer protection SIPROTEC 7UT8

4.4 Protection of motors in explosive environment

5 Redundant Power Supply

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

1 Operation and user experience

2 Designed to communicate

3 Safety and security inside

4 **Strong in industrial applications**

4.1 Protection of 400 V grids

4.2 Distributed busbar protection as extension of existing feeder protection

4.3 **Control, protection and monitoring with transformer protection SIPROTEC 7UT8**

4.4 Protection of motors in explosive environment

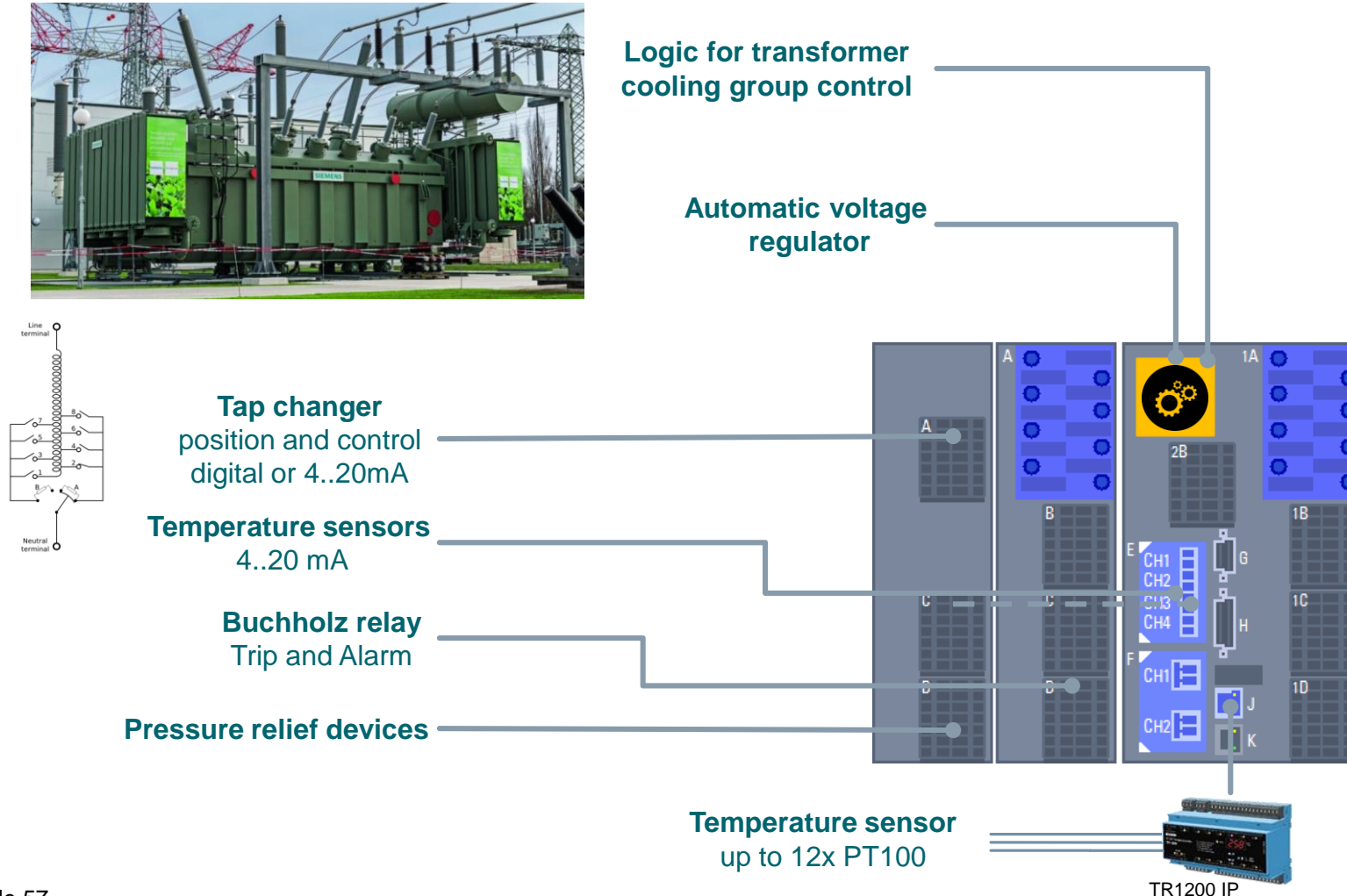
5 Redundant Power Supply

Control, protection and monitoring with SIPROTEC 7UT8 transformer protection



Highlights

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



1 Operation and user experience

2 Designed to communicate

3 Safety and security inside

4 **Strong in industrial applications**

4.1 Protection of 400 V grids

4.2 Distributed busbar protection as extension of existing feeder protection

4.3 Control, protection and monitoring with transformer protection SIPROTEC 7UT8

4.4 **Protection of motors in explosive environment**

5 Redundant Power Supply

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)



1 Operation and user experience

2 Designed to communicate

3 Safety and security inside

4 Strong in industrial applications

5 **Redundant Power Supply**

SIPROTEC 5 Modular – Redundant Power Supply

Application / Use cases



Use case 1:

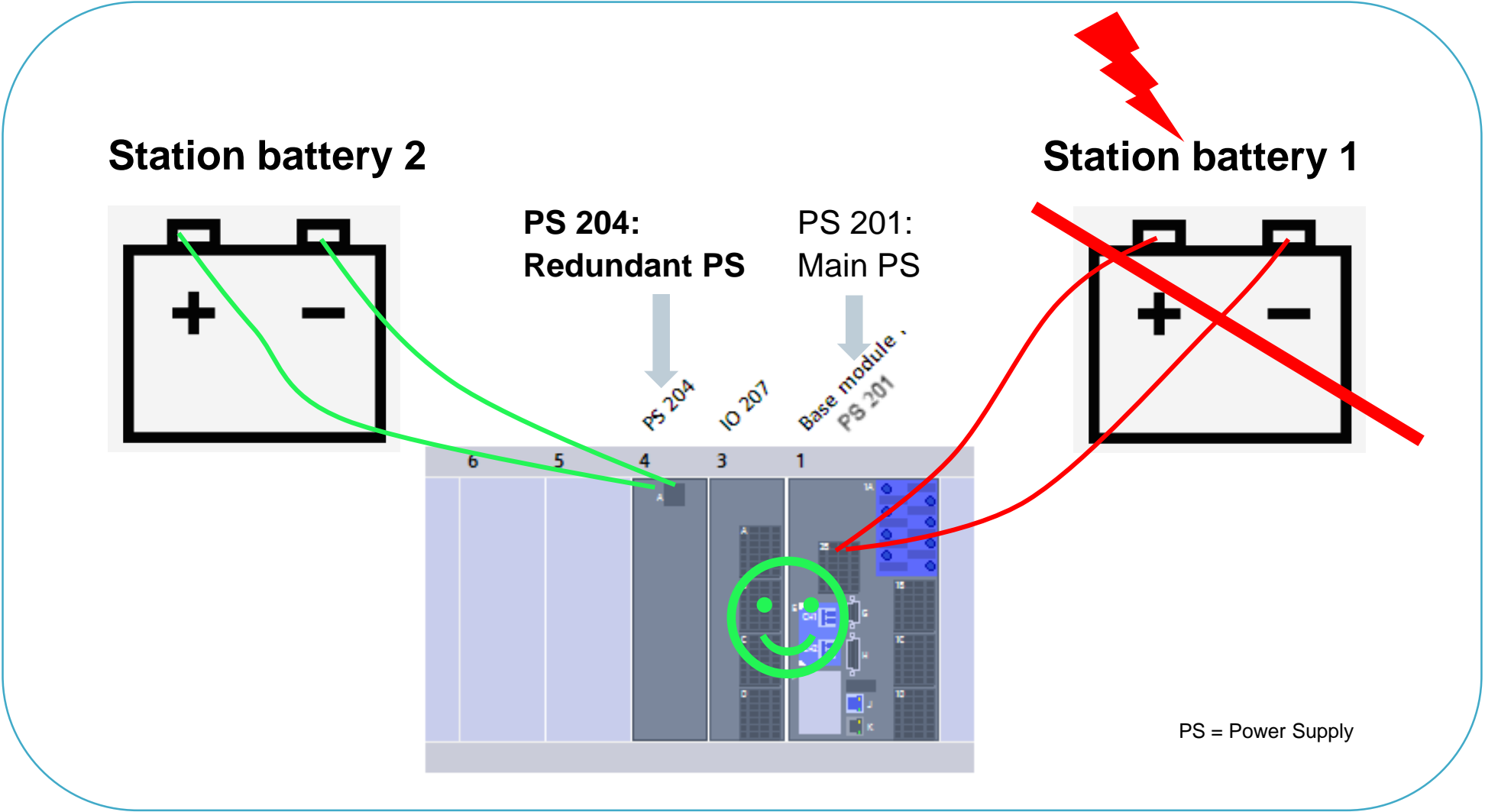
Ensure device operation in case of a failure in the battery system
► this requires a redundant battery system

Use case 2:

Ensure device operation in case of a failure of the device internal power supply

SIPROTEC 5 Modular – Redundant Power Supply

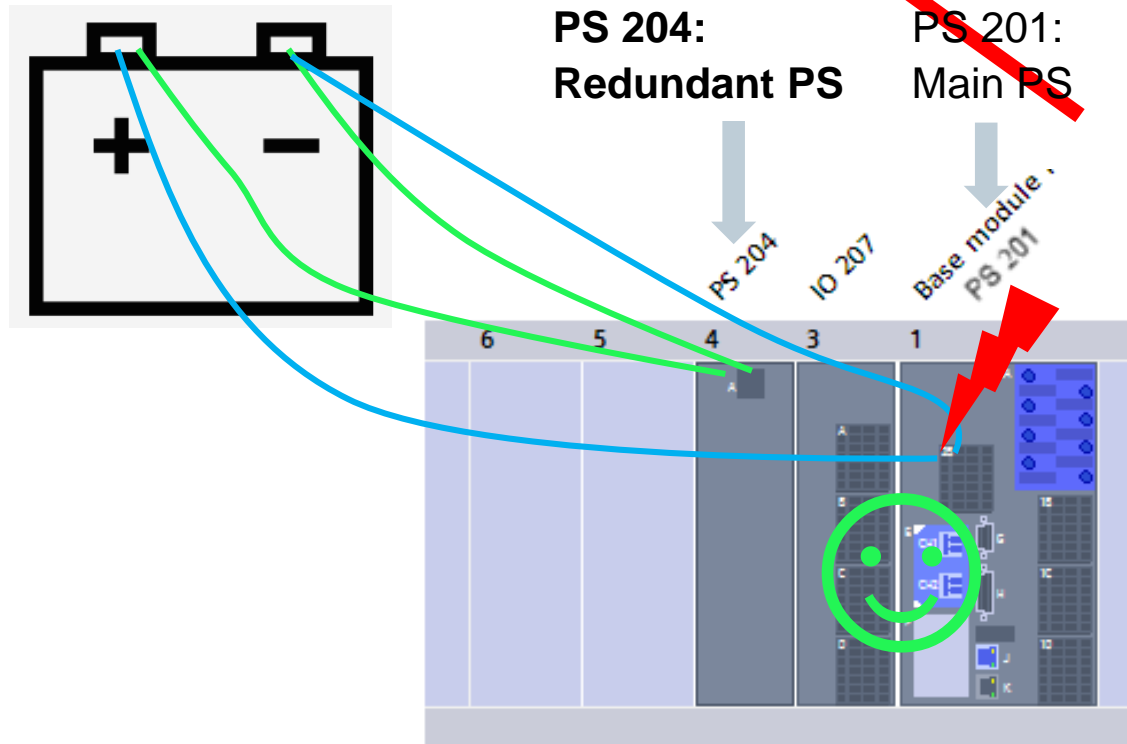
Use case 1: station battery failure



SIPROTEC 5 Modular – Redundant Power Supply

Use case 2: device-internal PS board failure

Station battery

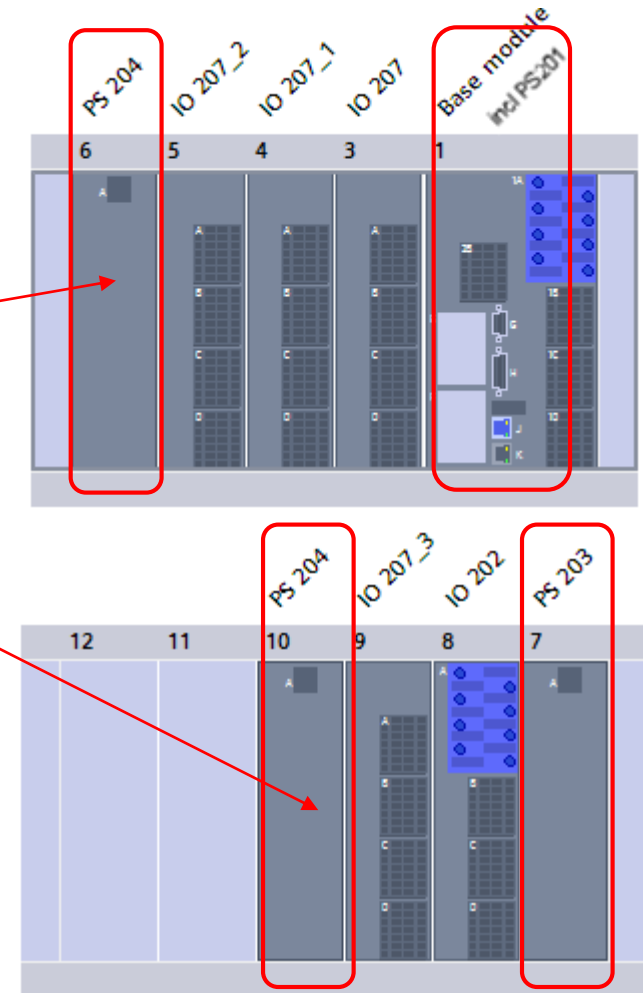


PS = Power Supply

SIPROTEC 5 Modular – Redundant Power Supply

Device definition conditions for devices with redundant power-supply

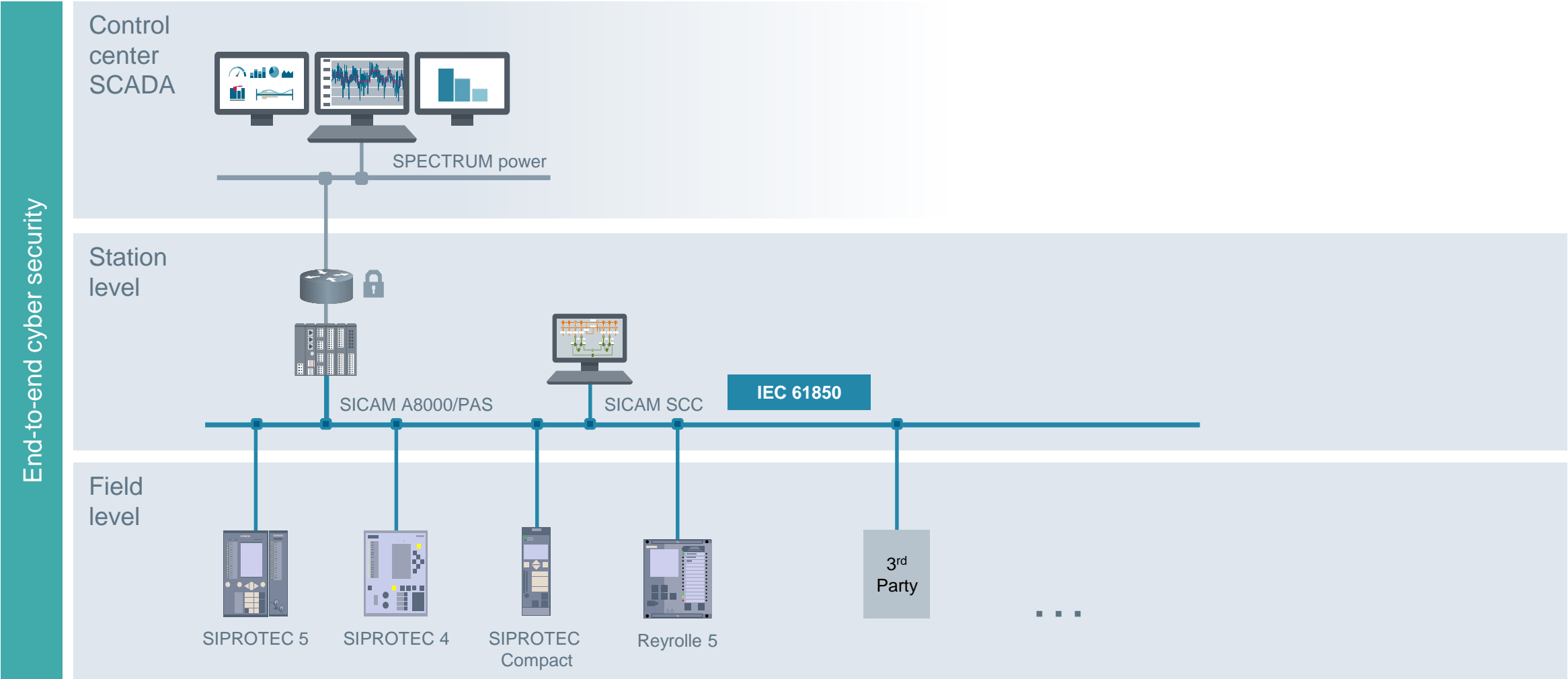
- Each device row requires a redundant PS204 board.
▶ I.e. a 2 row device has overall 4 PS boards: PS201, PS203, 2 x PS204
- PS204 needs to be located in the row end position (further information is given in the HW-Manual)
- Redundancy in the power supply is valid for all device boards apart from CB202 (plug-in module mother board)
- CB202 can be applied in a device with PS redundancy. However, CB202 has its own power supply and this is not backed up by the PS204



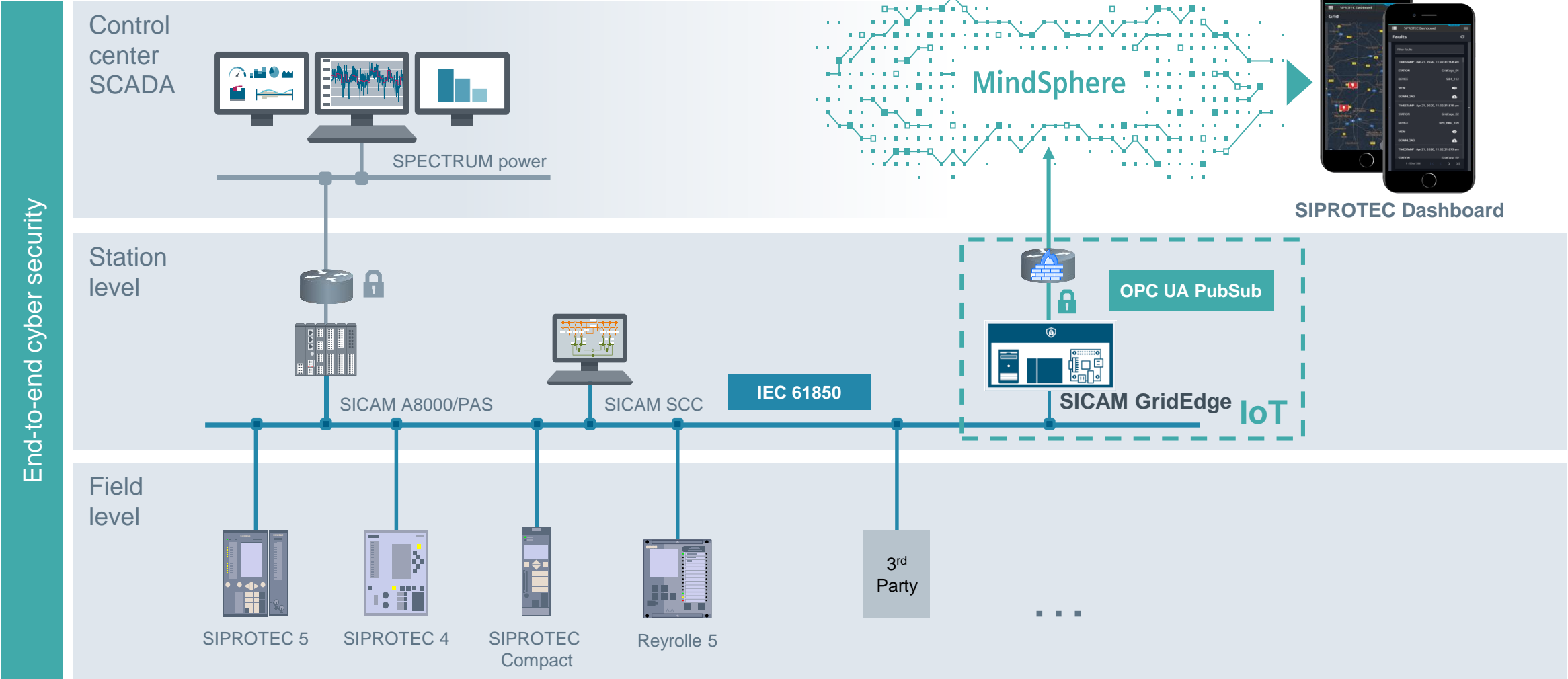
Grid Diagnostic Suite – SICAM GridEdge

IoT – Application @ Energy Automation

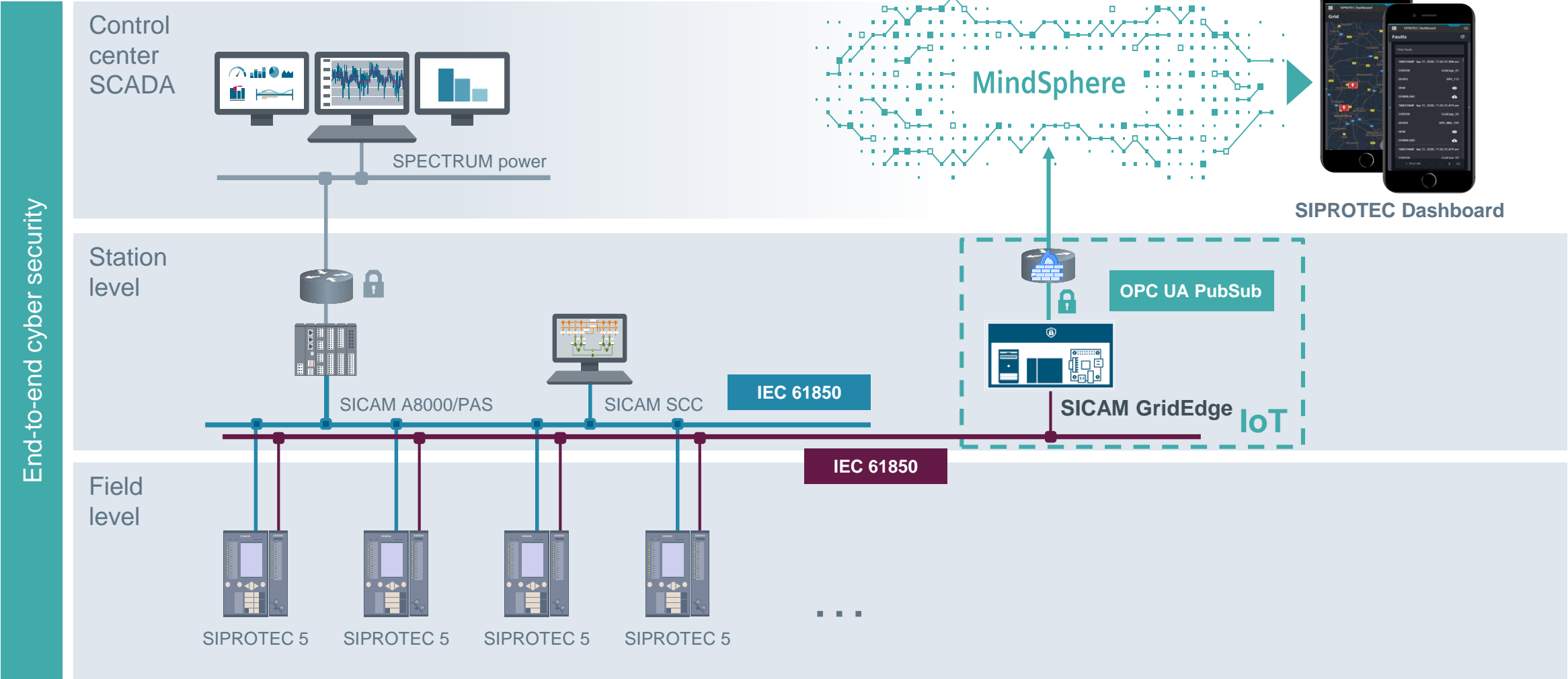
SICAM GridEdge – Setup of a typical substation automation and protection system



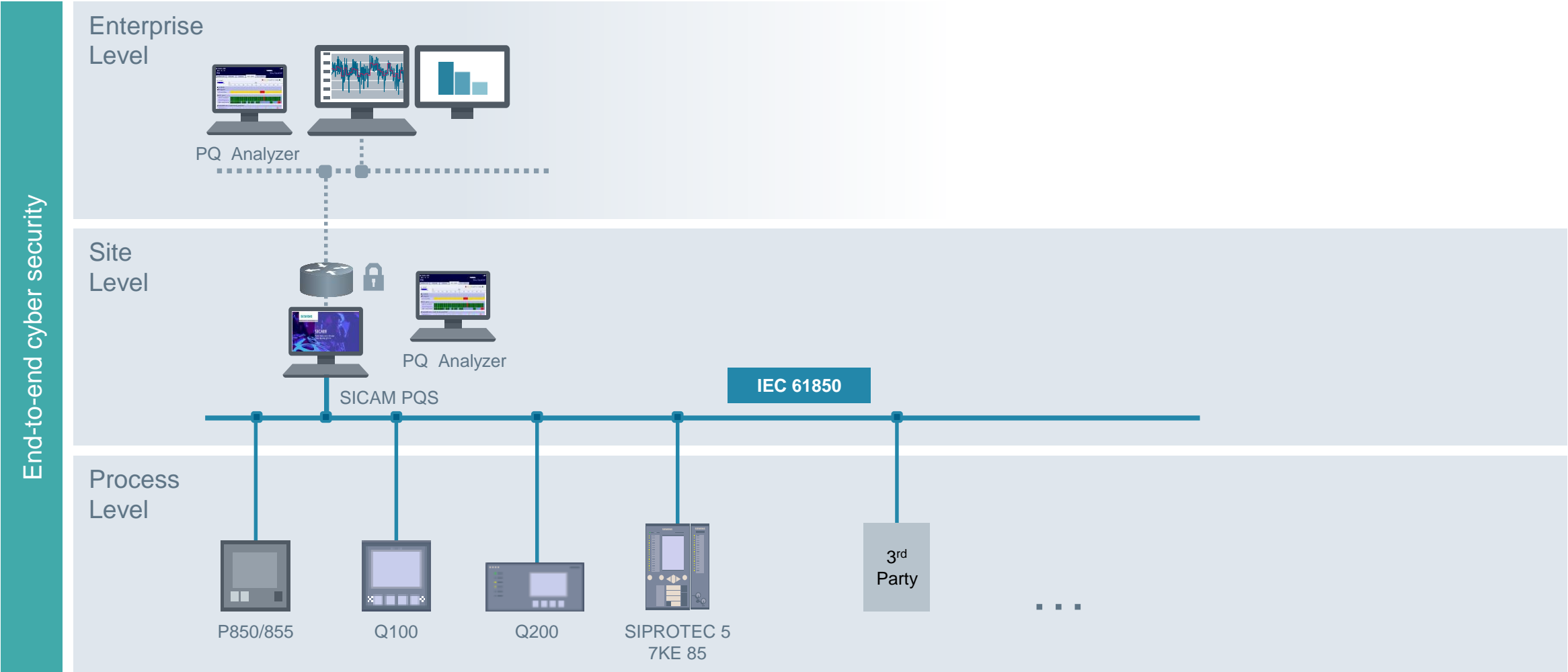
SICAM GridEdge – Makes IoT connectivity and security easy



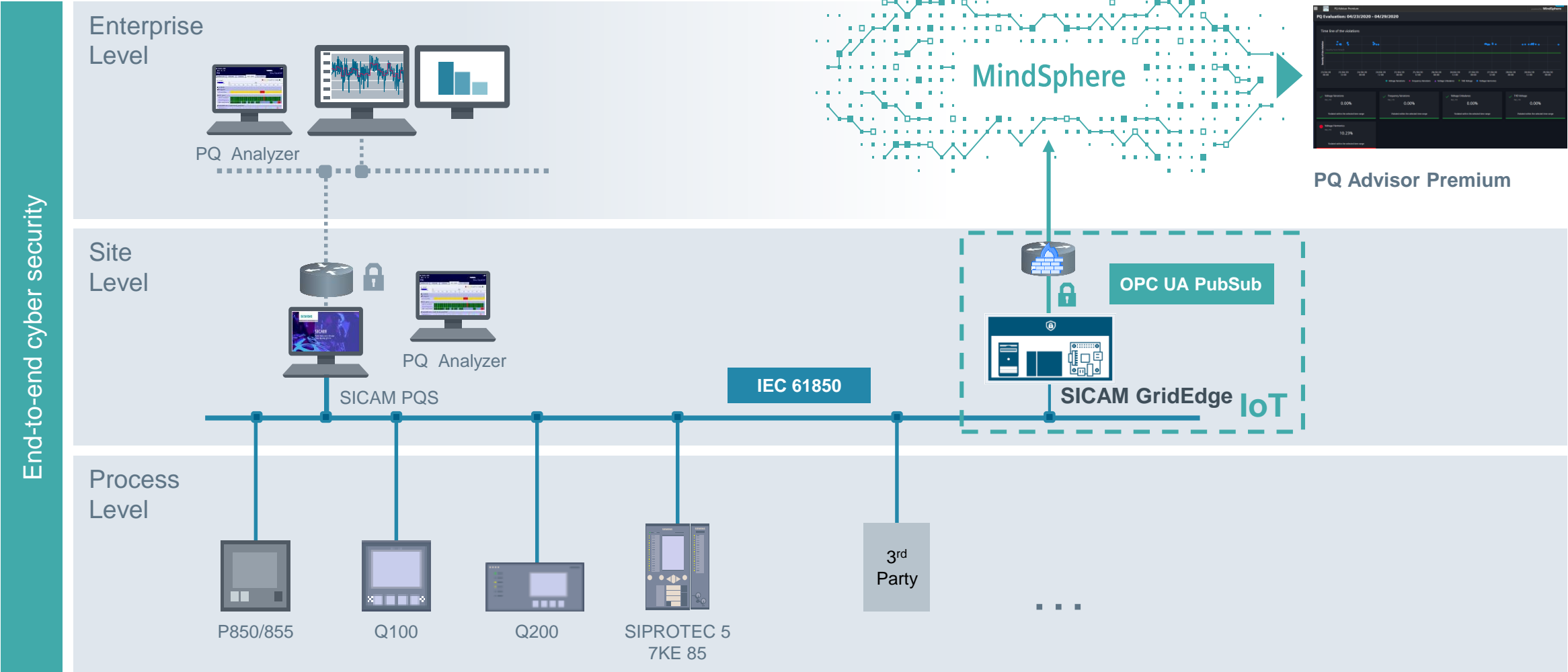
SICAM GridEdge – SIPROTEC 5 enhanced security using independent station LANs



SICAM GridEdge – Setup of a typical Power Quality System

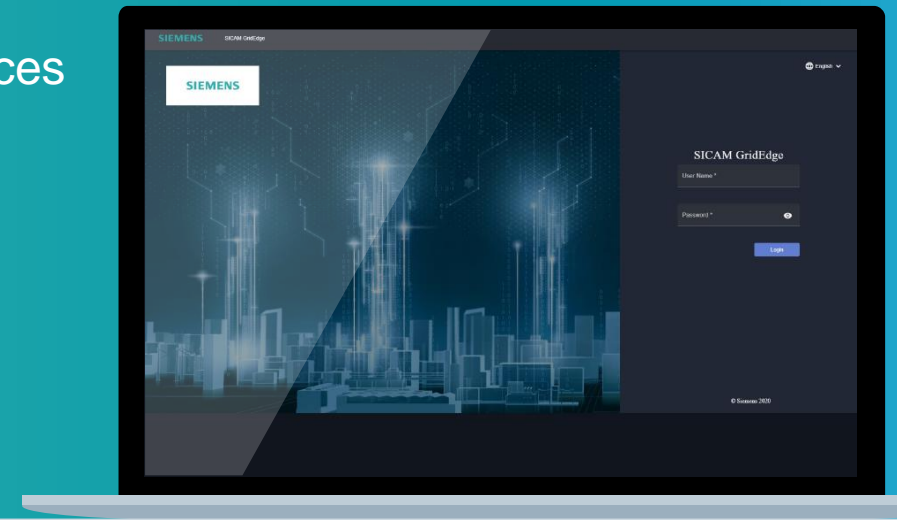


SICAM GridEdge – Makes IoT Connectivity and Security easy

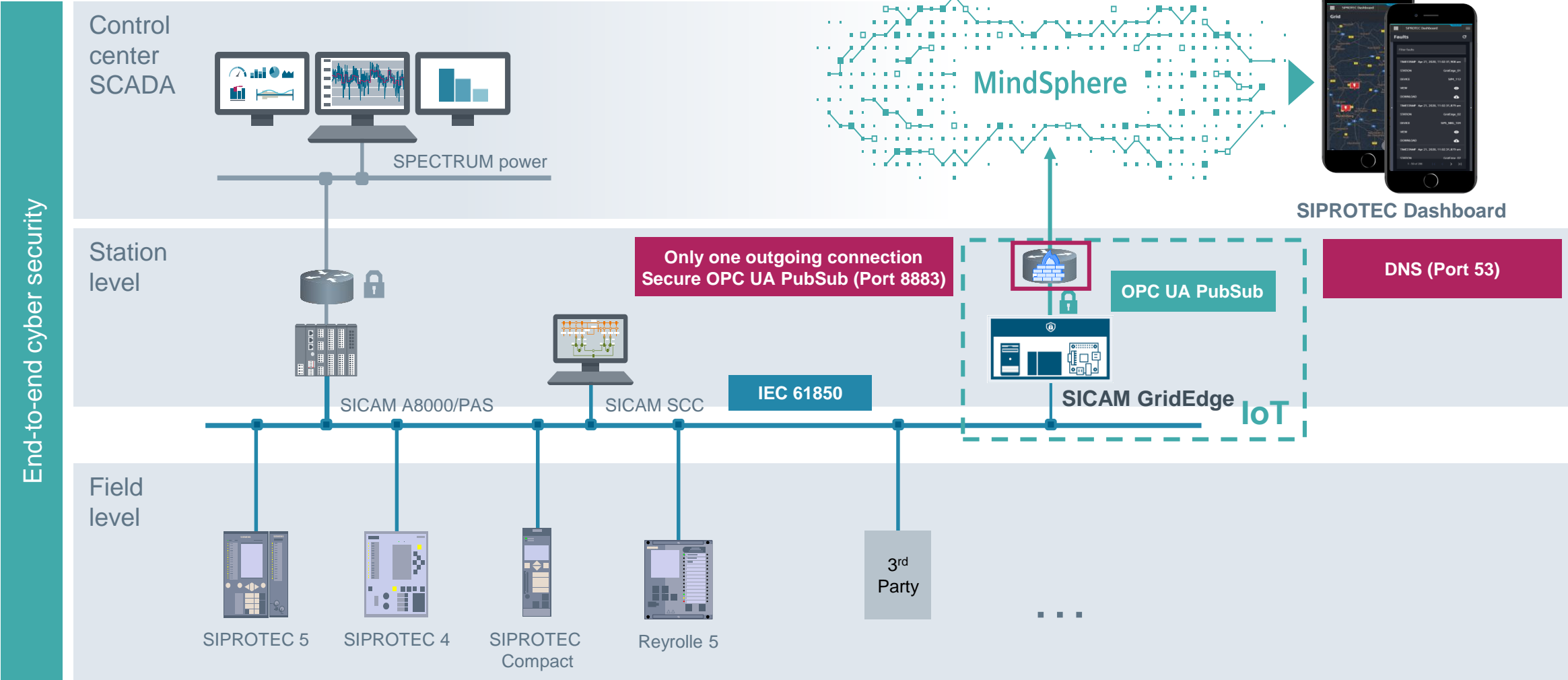


SICAM GridEdge – Advantages

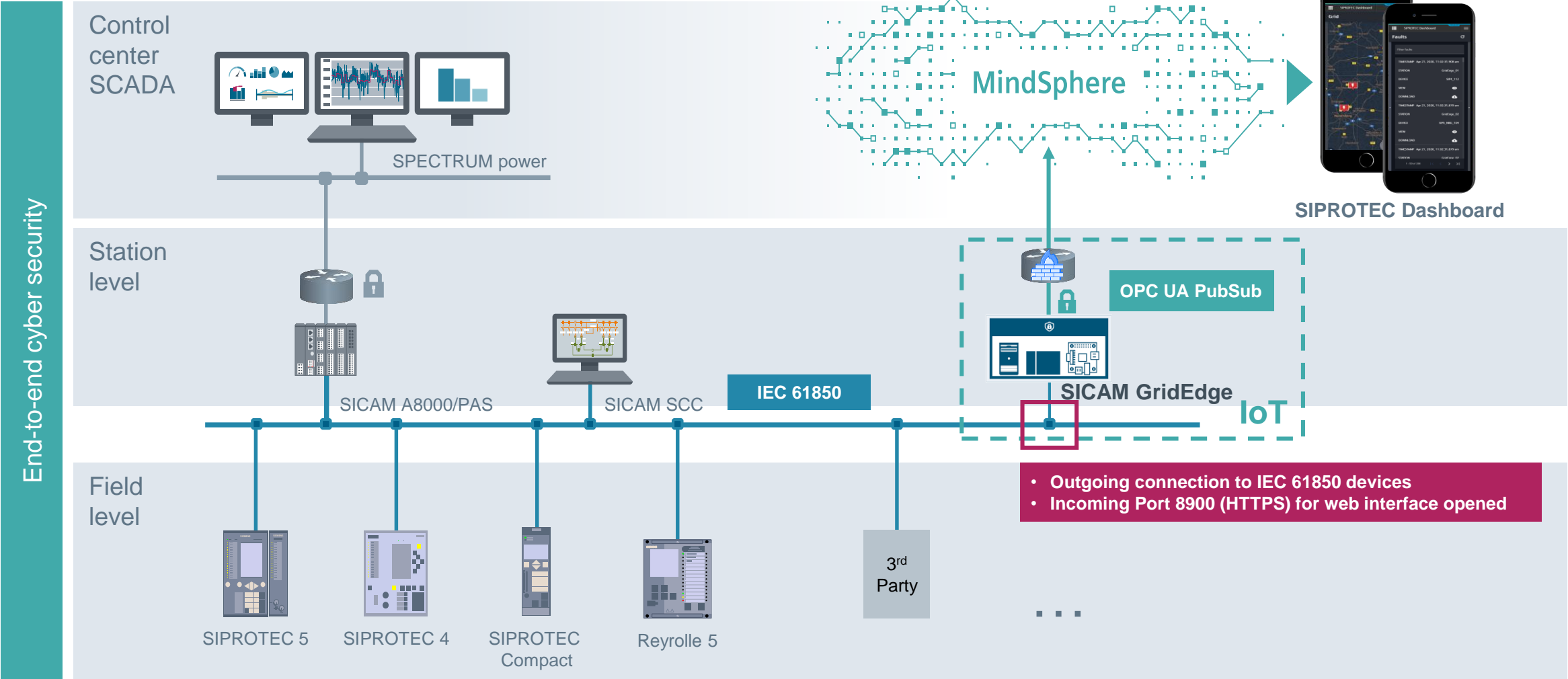
- “Zero Config” approach → no configuration changes @ SIPROTEC/Reyrolle and PQ devices
→ plug and play, i.e. configuration effort less than 30 min
- Complete certificate management in GridEdge
- Support of 3rd party devices via IEC 61850
- Support of all SIPROTEC/Reyrolle and PQ devices IEC 61850 portfolio
→ All SIPROTEC 5 ports supported, e.g. port J
- No Firmware or configuration changes in SIPROTEC/Reyrolle devices
- Support of all IEC 61850 Firmware versions
- Open for future Cloud connectivity
- Preprocessing possible → reduces amount of data/costs
- Based on Linux and well proven Container Technology



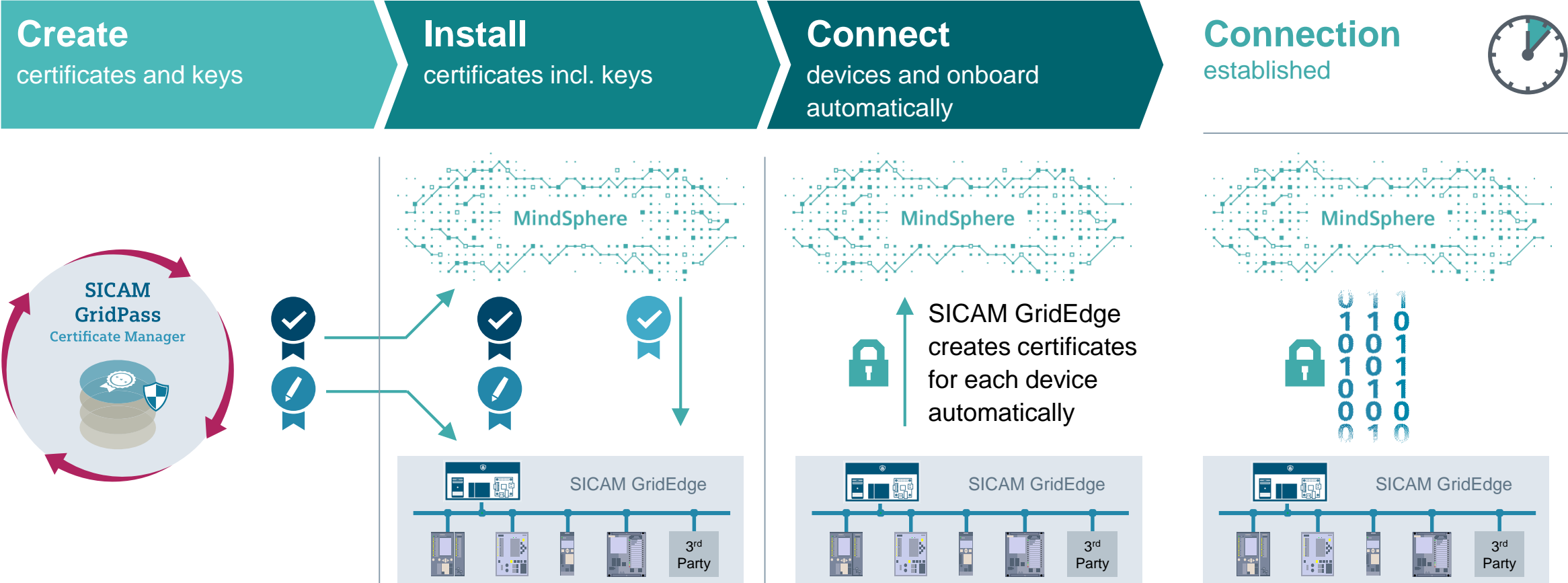
SICAM GridEdge – Enhanced security – Separated networks



SICAM GridEdge – Enhanced security – Reduced open ports



Grid Diagnostic Suite – Quick and secure onboarding – Getting connected in a few minutes with OPC UA Pub/Sub



Root certificate authority Subordinate certificate authority incl. public and private key Root Certificate authority of MindSphere

SIPROTEC Dashboard

The dark ~~side~~ mode

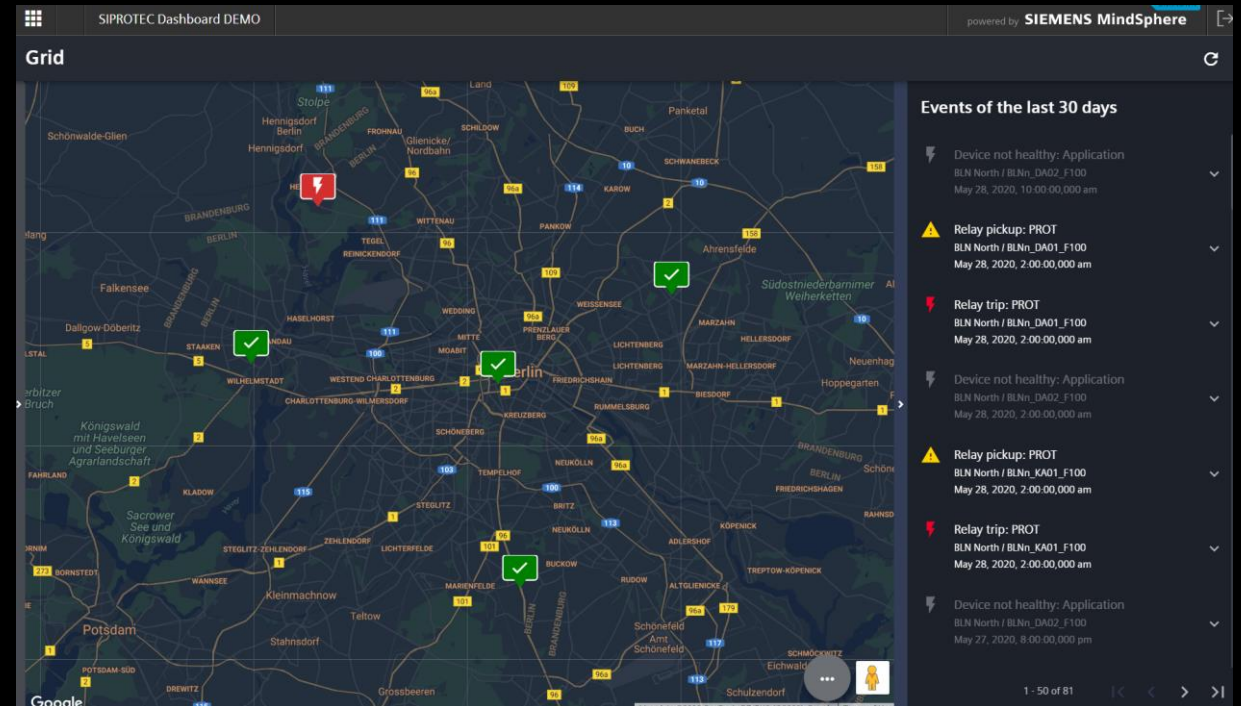
SIEMENS
Ingenuity for life

Dark Mode Design

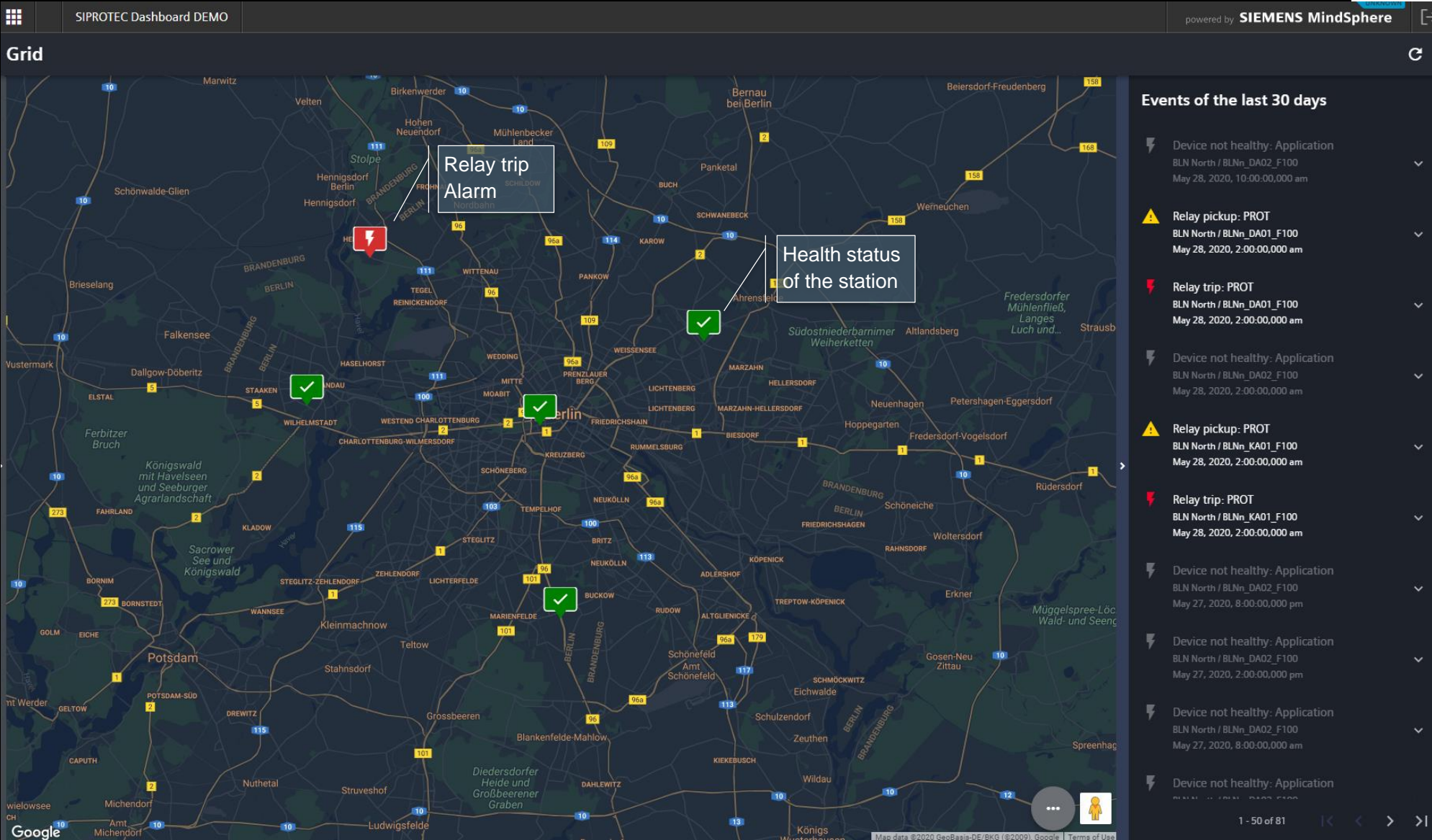


SIPROTEC Dashboard

Fully supports Mobile and Desktop resolutions



SIPROTEC Dashboard – Map View of your Grid




SIPROTEC Dashboard – Station View




BLN North

Grid > Devices

 **BLNn_DA02_F100**


SIPROTEC 7UT87

Transformer differential protection




Device not healthy


Health status of all
devices in a Substation

 **BLNn_DA01_F100**

SIPROTEC 7UT87


Transformer differential protection




 **BLNn_KA01_F100**

SIPROTEC 7SJ63


Overcurrent and motor protection




 **BLNn_KA02_F100**

SIPROTEC 7SJ63


Overcurrent and motor protection




 **BLNn_KA03_F100**

SIPROTEC 7SJ63


Overcurrent and motor protection




 **BLNn_KA04_F100**

SIPROTEC 7SJ63


Overcurrent and motor protection




 **BLNn_KA05_F100**

SIPROTEC 7SJ63


Overcurrent and motor protection



 **BLNn_KA06_F100**

SIPROTEC 7SJ63

Overcurrent and motor protection



SIPROTEC Dashboard – Device View



BLNn_DA02_F100

Grid > BLN North > Device information



Device Information

Logs

Setting Changes

Communication status

Device status

Device not healthy

Health

Device not healthy

Application

since May 28, 2020, 10:15:42,880 am

IEC 61850 communication

Online

Timestamp could not be determined

MindSphere communication

Online

Timestamp could not be determined

Device information

Manufacturer

SIEMENS

Device type

SIPROTEC 7UT87

Transformer differential protection

Firmware version

Mainboard: V7.90

Communication module port E (ETH-BA-2EL): V7.90

Serial number

BM1708001933

Product code

7UT87-DAAA-AA0-0AAAA0-A90211-13112B-AAA000-000AC0-CB1BA2

Detailed information

CPU type

CP300

Power supply

DC 24 V to 48 V

Integrated Ethernet port J

DIGSI 5 connection and IEC 61850 reporting

Mounting positions

Mounting position 1: IO202

Mounting position 2: PS201

SIPROTEC Dashboard – Log files



BLNn_DA01_F100

Grid > BLN North > Logs



Device Information

Logs

Settings Changes

Filter logs

All logfiles
• Fault logs
• Operation Logs
• etc.

Visualization & Download
options available

Timestamp ↓	Type	Download log	View record	Download record
May 28, 2020, 12:00:00,000 a...	Fault log			
May 26, 2020, 12:00:00,000 a...	Fault log			
May 22, 2020, 12:00:00,000 a...	Fault log			
May 18, 2020, 12:00:00,000 a...	Fault log			
May 6, 2020, 12:00:00,000 am	Fault log			
Apr 24, 2020, 12:00:00,000 am	Fault log			
Apr 20, 2020, 12:00:00,000 am	Fault log			

SIPROTEC Dashboard – Real time Setting Changes



BLNn_DA01_F100

Grid > BLN North > Logs

Device Information

Logs

Setting Changes

Delete	Last Change
	02/03/2020 10:10:23
	<div><div>LN1_21 Distance Prot 1 \ DISA_PTRC1</div><div><div>Operate delay:</div><div>VO Threshold:</div></div><div><div>Old</div><div>New</div></div><div><div>0.21</div><div>0.22</div></div><div><div>0.21</div><div>0.22</div></div></div>
	01/17/2020 12:22:17
	01/12/2020 08:25:08

Recording & Storing all changes

SIPROTEC Dashboard – Grid spanning Fault Records



Faults

Comprehensive filter options

Filter faults

All Substations

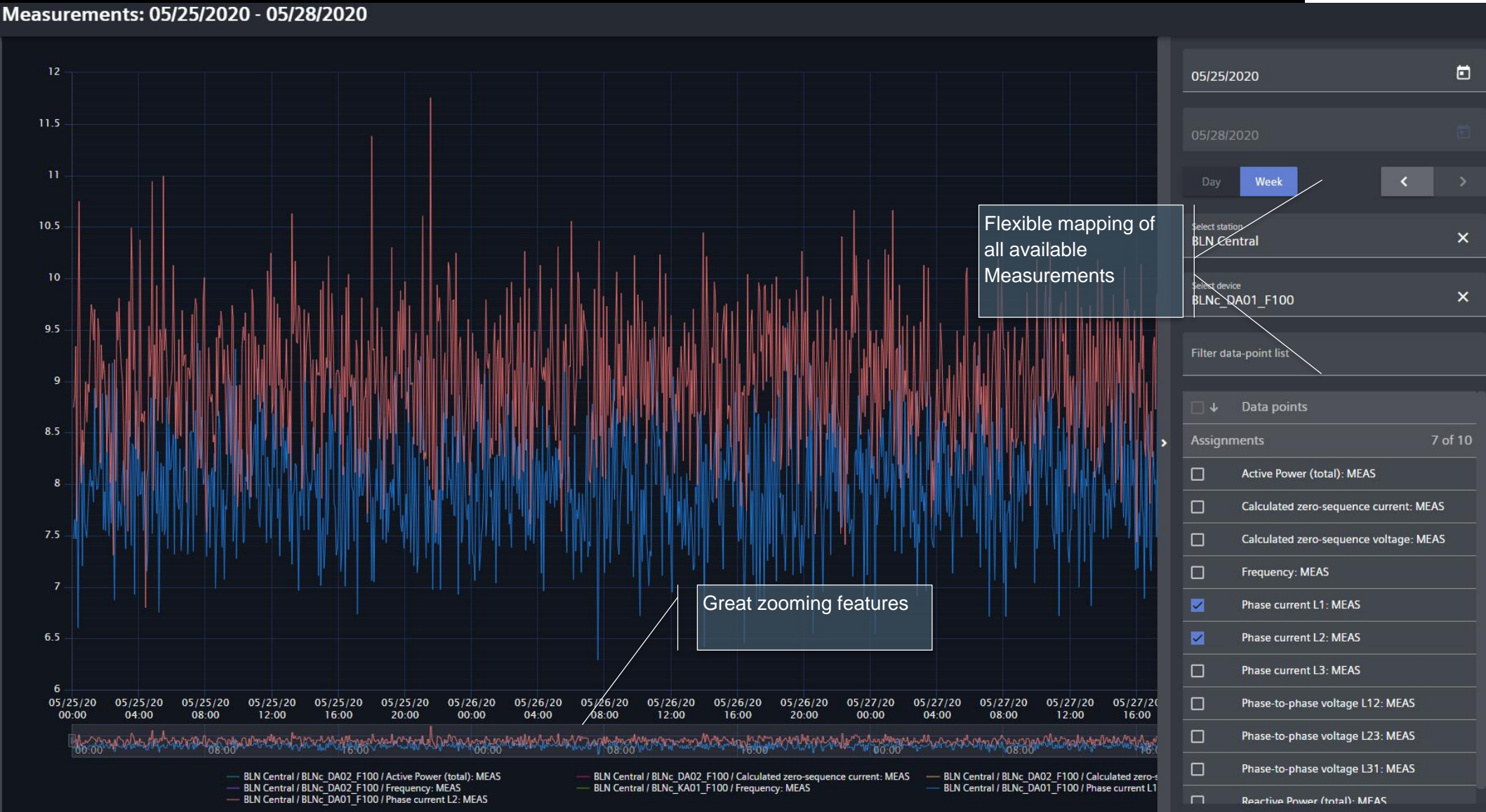
Visualization & Download options available

Timestamp ↓	Station	Device	View	Download
May 28, 2020, 12:00:00,000 am	BLN North	BLNn_DA01_F100		
May 28, 2020, 12:00:00,000 am	BLN North	BLNn_KA01_F100		
May 26, 2020, 12:00:00,000 am	BLN North	BLNn_DA01_F100		
May 26, 2020, 12:00:00,000 am	BLN North	BLNn_KA01_F100		
May 22, 2020, 12:00:00,000 am	BLN North	BLNn_DA01_F100		
May 22, 2020, 12:00:00,000 am	BLN North	BLNn_KA01_F100		
May 18, 2020, 12:00:00,000 am	BLN North	BLNn_DA01_F100		
May 18, 2020, 12:00:00,000 am	BLN North	BLNn_KA01_F100		
May 6, 2020, 12:00:00,000 am	BLN North	BLNn_DA01_F100		
May 6, 2020, 12:00:00,000 am	BLN North	BLNn_KA01_F100		
Apr 24, 2020, 12:00:00,000 am	BLN North	BLNn_DA01_F100		
Apr 24, 2020, 12:00:00,000 am	BLN North	BLNn_KA01_F100		
Apr 20, 2020, 12:00:00,000 am	BLN North	BLNn_DA01_F100		
Apr 20, 2020, 12:00:00,000 am	BLN North	BLNn_KA01_F100		

SIPROTEC Dashboard – Fault Record Comtrade View



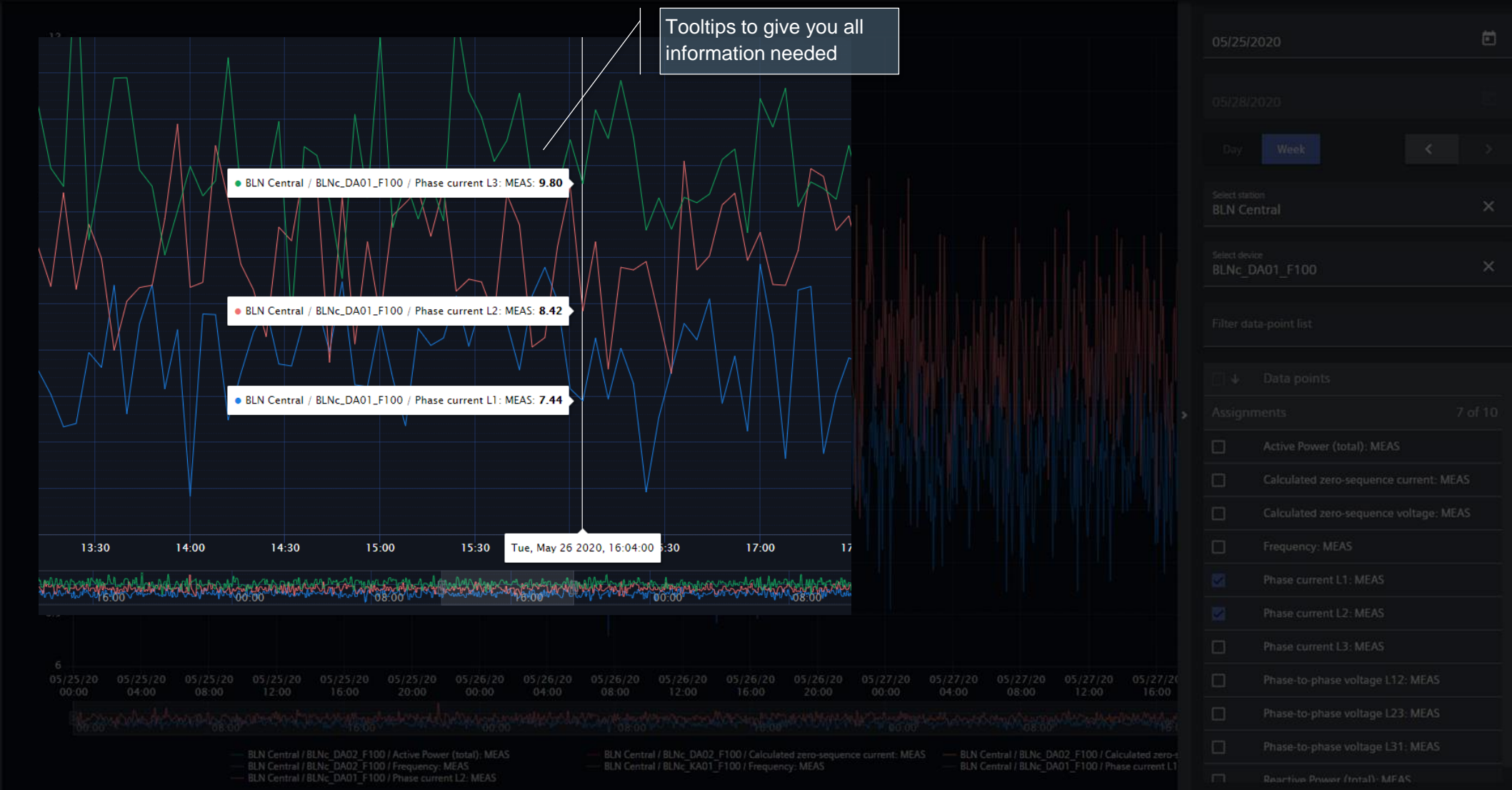
SIPROTEC Dashboard – Flexible Measurement View



SIPROTEC Dashboard – Flexible Measurement View



Measurements: 05/25/2020 - 05/28/2020



SIPROTEC Dashboard – Grid spanning Fault Records



Firmware

Filter firmware data

Comprehensive filter options

All Substations & Devices

Device types & Components

Station ↑	Device	Device type	Component	Firmware version
BLN Central	BLNc_DA01_F100	SIPROTEC 7UT85 Transformer differential protecti...	Mainboard	V7.90
BLN Central	BLNc_DA01_F100	SIPROTEC 7UT85 Transformer differential protecti...	Communication module port E (ETH-BA-2EL)	V7.90
BLN Central	BLNc_DA02_F100	SIPROTEC 7UT85 Transformer differential protecti...	Mainboard	V7.90
BLN Central	BLNc_DA02_F100	SIPROTEC 7UT85 Transformer differential protecti...	Communication module port E (ETH-BA-2EL)	V7.90
BLN Central	BLNc_KA01_F100	SIPROTEC 6MD61 Bay controller	Mainboard	V4.60
BLN Central	BLNc_KA01_F100	SIPROTEC 6MD61 Bay controller	Communication module (EN100)	V04.37
BLN Central	BLNc_KA01_F101	ABC_2	Mainboard	V3.14
BLN Central	BLNc_KA02_F100	SIPROTEC 6MD61 Bay controller	Mainboard	V4.60
BLN Central	BLNc_KA02_F100	SIPROTEC 6MD61 Bay controller	Communication module (EN100)	V04.37
BLN Central	BLNc_KA02_F101	ABC_2	Mainboard	V3.14
BLN Central	BLNc_KA03_F100	SIPROTEC 6MD61 Bay controller	Mainboard	V4.60
BLN Central	BLNc_KA03_F100	SIPROTEC 6MD61 Bay controller	Communication module (EN100)	V04.37
BLN Central	BLNc_KA03_F101	ABC_2	Mainboard	V3.14
BLN East	BLNe_KA01_F100	REYROLLE 7SR51 Overcurrent time and feeder pr...	Mainboard	V02.10
BLN East	BLNe_KA01_F100	REYROLLE 7SR51 Overcurrent time and feeder pr...	Communication module (EN100)	V01.11

1 - 50 of 73

<<

<

>

>>

SIPROTEC Dashboard – Internet Online Demo



Grid Diagnostic Suite Demos

SIPROTEC Dashboard

Agility in Energy

SICAM Navigator

Demo Video

PQ Advisor Premium

Demo Video

SICAM Localizer

► Energy goes digital

► MindSphere Store

<http://demo.overview.gds-energy.siemens.cloud/>

Kontaktoplysninger



Anders Dahl Johnsen

Salgsspecialist

Tlf: +45 21 55 11 71

E-mail: anders.johnsen@siemens.com

siemens.com/digital-grid