

Konference Energetické Rušení 2024



Batterie **Inspektor**[™] – Framework and applications

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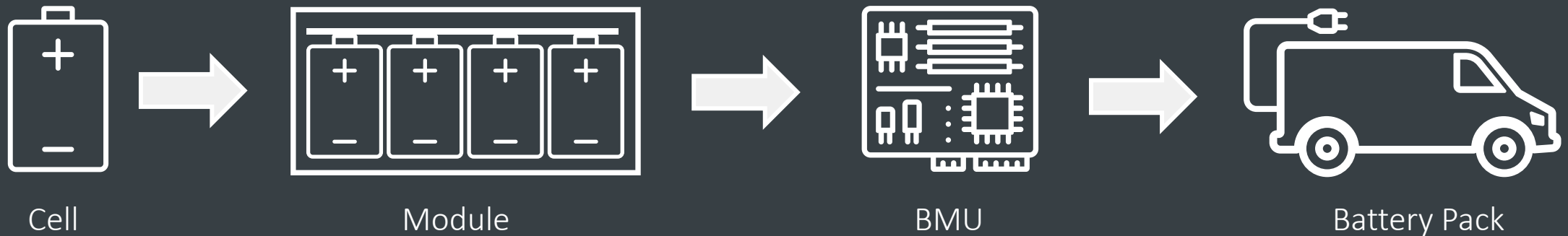
About Avera

Global Test & Quality Engineering Systems Integrator



Batterie Inspektor

Reliable Quality from the Cell to the System

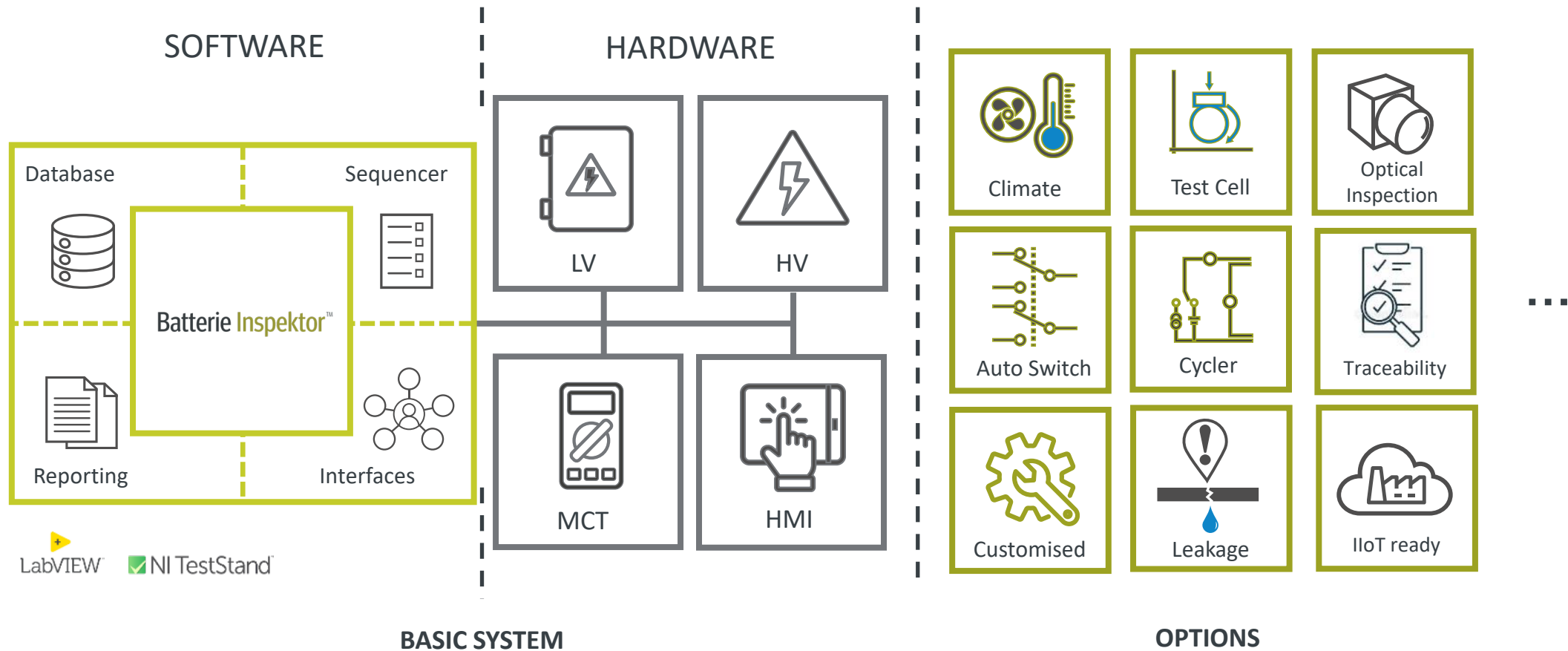


Consulting
Service
Maintenance

Process Control
Optical Inspection

Function Tester
End-of-Line Tester

Test System for Manufacturing



Averna's Solution Description

Standardized software framework for battery testing ... from cell to pack.

- With a wide range of test parameters, Batterie Inspektor™ ensures top quality products including cells, modules, BMUs and packs, at every stage of manufacturing.
- Modular and scalable design to meet different manufacturing requirements and battery types to cover all test requirements specified in the LV 123.
- Improves product performance with flexible automation, sustainable retrofitting, and smart data management.
- Increases ROI with market-leading technology and state-of-the-art 2D/3D image processing.
- Accelerates manufacturing with fast implementation and simple usability.



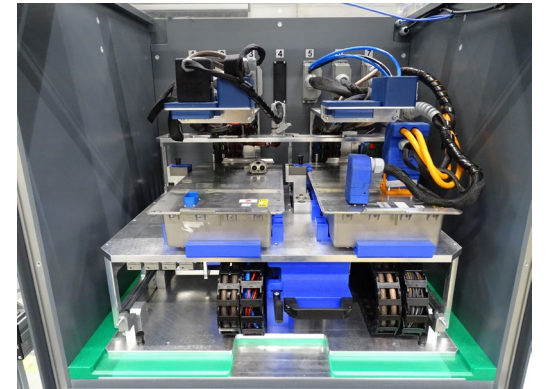
Cell Tester, Forming & Aging



- Different cell types (cylindrical, prismatic, pouch)
- Measurement of temperature, voltage and current
- Impedance measurement
- Individually controlled bi-directional DC voltage source per DUT
- Climatic test chamber with DUT holders for up to 16 cells in parallel operation (expandable to 32 cells)
- Current carrying capacity per channel up to 250 A
- Test station control with PLC and safety control system
- Comprehensive software application with HMI

UBT (universal box tester) Station

- Function test for control units and junction box
- Test sequencer with TestStand
- MCT technology based on PXI
- Insulation resistance > 100 M Ω
- Voltage resistance at 2500 VDC
- Interlock function test
- Read / write IDs
- LabVIEW: Control, monitoring, processing of measurement data and documentation of test procedures



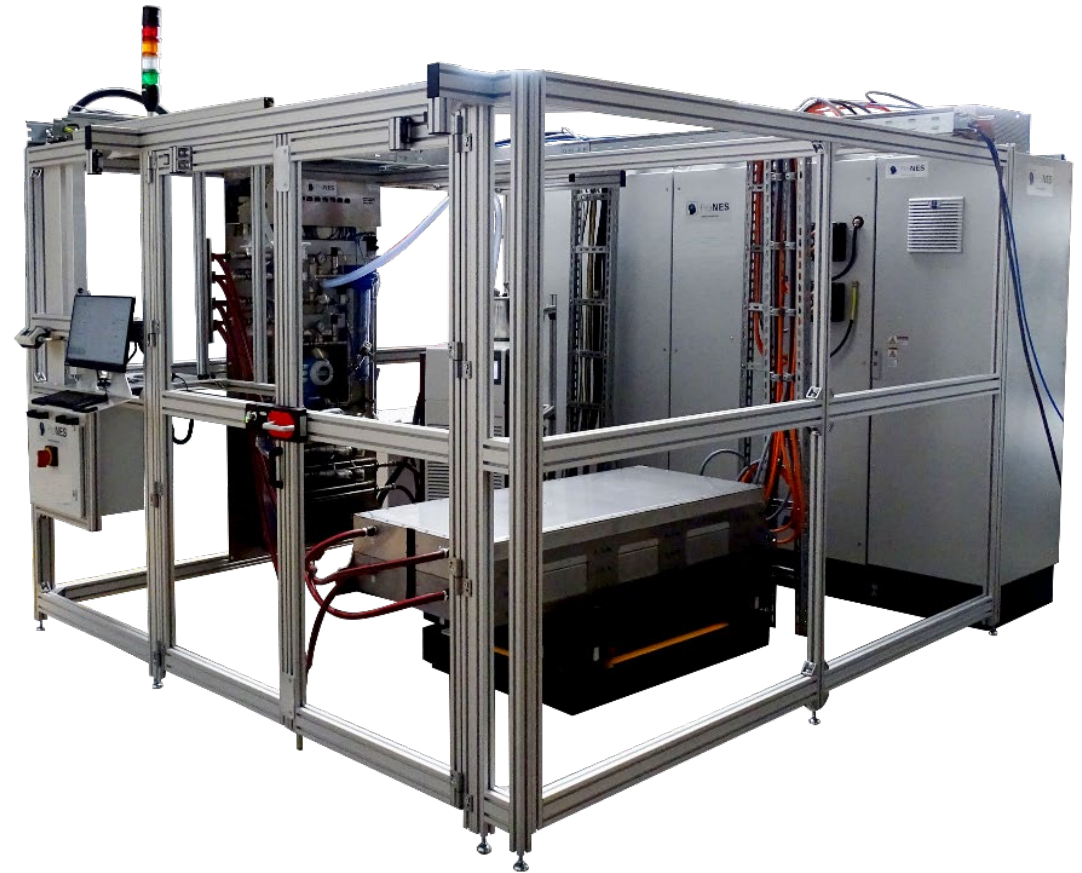
System EOL Tester



- Adaptation to different battery types with unchanged hardware
- Verification of generally applicable and type-specific safety and quality parameters
- Software-supported check of all measuring sensors
- Validation of different currents under electrical load
- Climate plate to simulate different climatic conditions
- Test station control with PLC and safety control system
- Comprehensive software application with HMI
- Digitalised integration in cross-departmental corporate network

Tasks in End-of-Line Testing

- Liquid cooling / heating
 - Working temperature -45 to 250 °C
 - Flow rate 35 to 76 l/min
 - Pressure 0.48 to 3.2 bar
 - Expansion volume 60 l
- Flashing of drivers and software
- Calibration
- Configuration
- Testing of safety functions
- Testing of all device functions
- Validation of different currents under electrical load
- Charging to delivery state of capacity up to 15 kW
- Label printing



Averna – Station Design

- More than 50 different functional tests with several measuring points such as

Temperature

Voltage

Current

Pressure

Volume rate
of flow

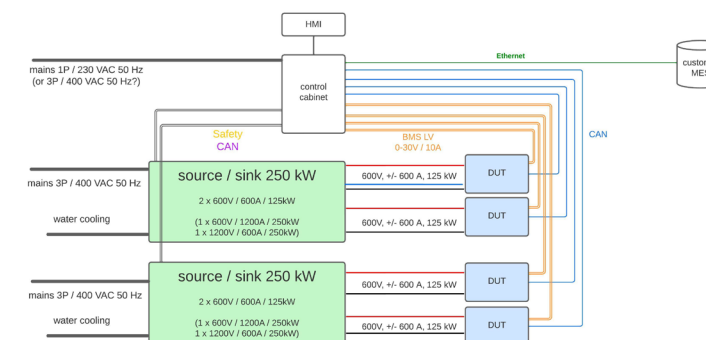
CAN messages



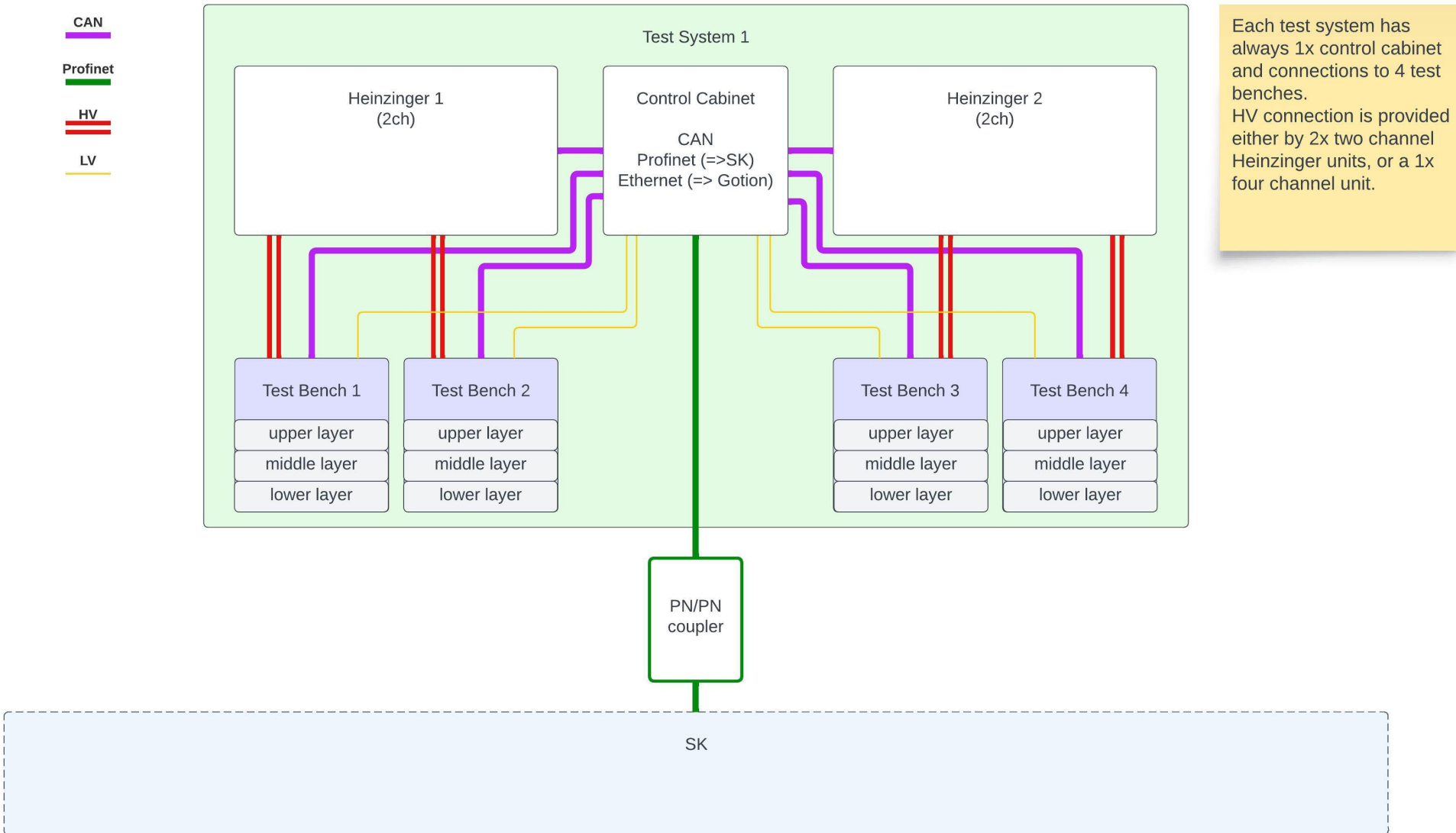
Pack line– application



Block diagram 2x2-channel source/sink



Pack line– application



Pack line– application



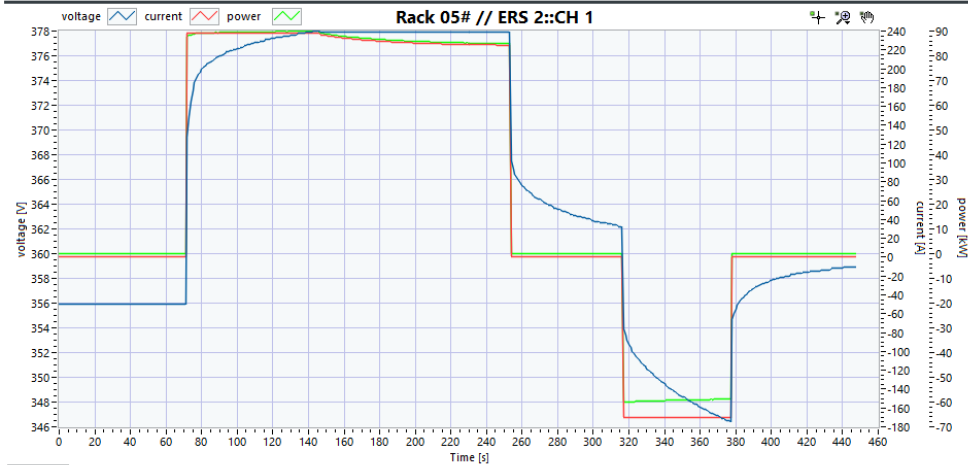
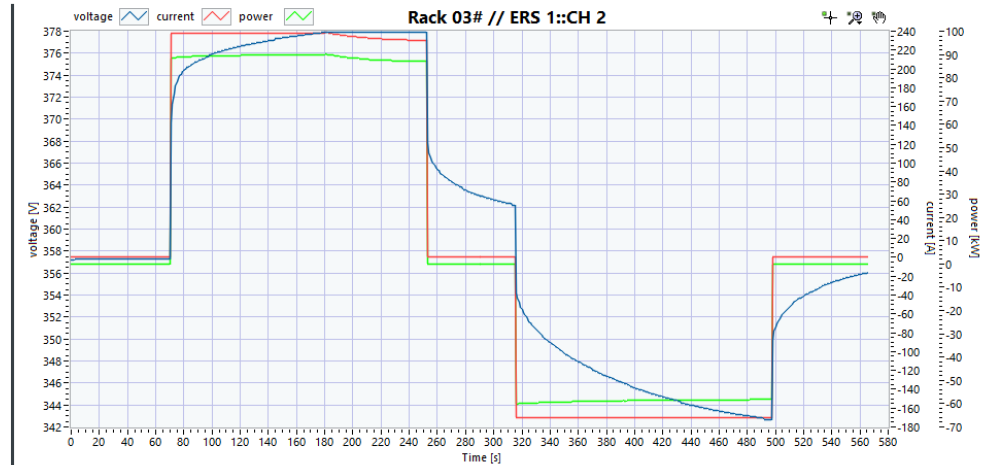
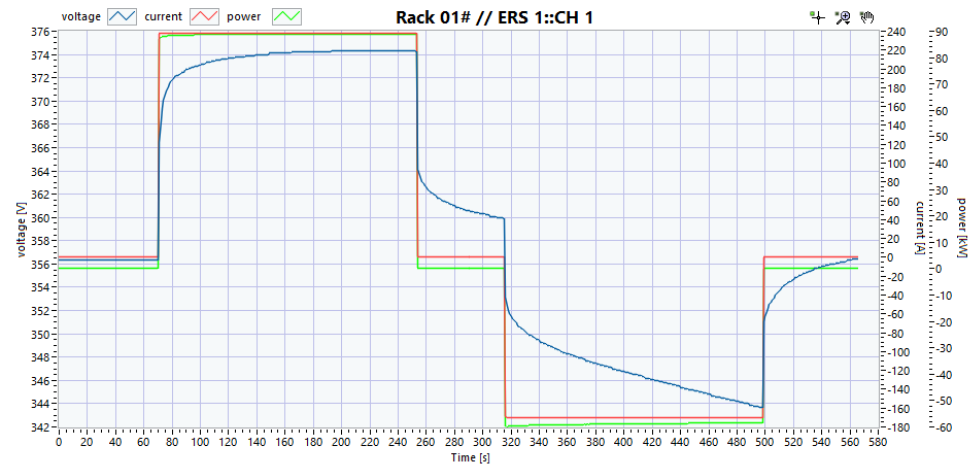
Rack 01# // ERS 1::CH 1				
Heinzinger ERS				
Voltage	351,0			
Current	-170,0 A			
Power	-59,6 kW			
BMS				
Voltage Pack 1	117,6 V			
Voltage Pack 2	117,5 V			
Voltage Pack 3	117,5 V			
SOC	50,0 %			
	Min	Max	Delta	Cell-No
Cell Voltage	3,254 V	3,269 V	0,015 V	Min: 23 / Max: 30
Temperature	22,0 °C	23,0 °C	1,0 °C	Min: 3 / Max: 1
Sequence				
Test started	10.01.2024 15:29:45			
Test finished				
Result				
1 connect				
2 pause	60s			
3 charge	CC: 378.0V, 238.0A, 95.0kW / 136.0A, 180s			
4 pause	60s			
5 discharge	CC: 270.0V, 170.0A, 125.0kW / 17.0A, 180s			
6 pause	60s			
7 disconnect				

Rack 03# // ERS 1::CH 2				
Heinzinger ERS				
Voltage	352,4			
Current	-169,9 A			
Power	-59,8 kW			
BMS				
Voltage Pack 1	118,2 V			
Voltage Pack 2	118,2 V			
Voltage Pack 3	118,2 V			
SOC	50,0 %			
	Min	Max	Delta	Cell-No
Cell Voltage	3,273 V	3,287 V	0,014 V	Min: 44 / Max: 102
Temperature	22,0 °C	23,0 °C	1,0 °C	Min: 3 / Max: 1
Sequence				
Test started	10.01.2024 15:29:46			
Test finished				
Result				
1 connect				
2 pause	60s			
3 charge	CC: 378.0V, 238.0A, 95.0kW / 136.0A, 180s			
4 pause	60s			
5 discharge	CC: 270.0V, 170.0A, 125.0kW / 17.0A, 180s			
6 pause	60s			
7 disconnect				

Rack 05# // ERS 2::CH 1				
Heinzinger ERS				
Voltage	366,4			
Current	0,0 A			
Power	0,0 kW			
BMS				
Voltage Pack 1	124,8 V			
Voltage Pack 2	122,5 V			
Voltage Pack 3	123,3 V			
SOC	50,0 %			
	Min	Max	Delta	Cell-No
Cell Voltage	3,390 V	3,397 V	0,007 V	Min: 37 / Max: 3
Temperature	20,0 °C	22,0 °C	2,0 °C	Min: 3 / Max: 1
Sequence				
Test started	10.01.2024 15:30:52			
Test finished				
Result				
1 connect				
2 pause	60s			
3 charge	CC: 378.0V, 238.0A, 95.0kW / 136.0A, 180s			
4 pause	60s			
5 discharge	CC: 270.0V, 170.0A, 125.0kW / 17.0A, 180s			
6 pause	60s			
7 disconnect				

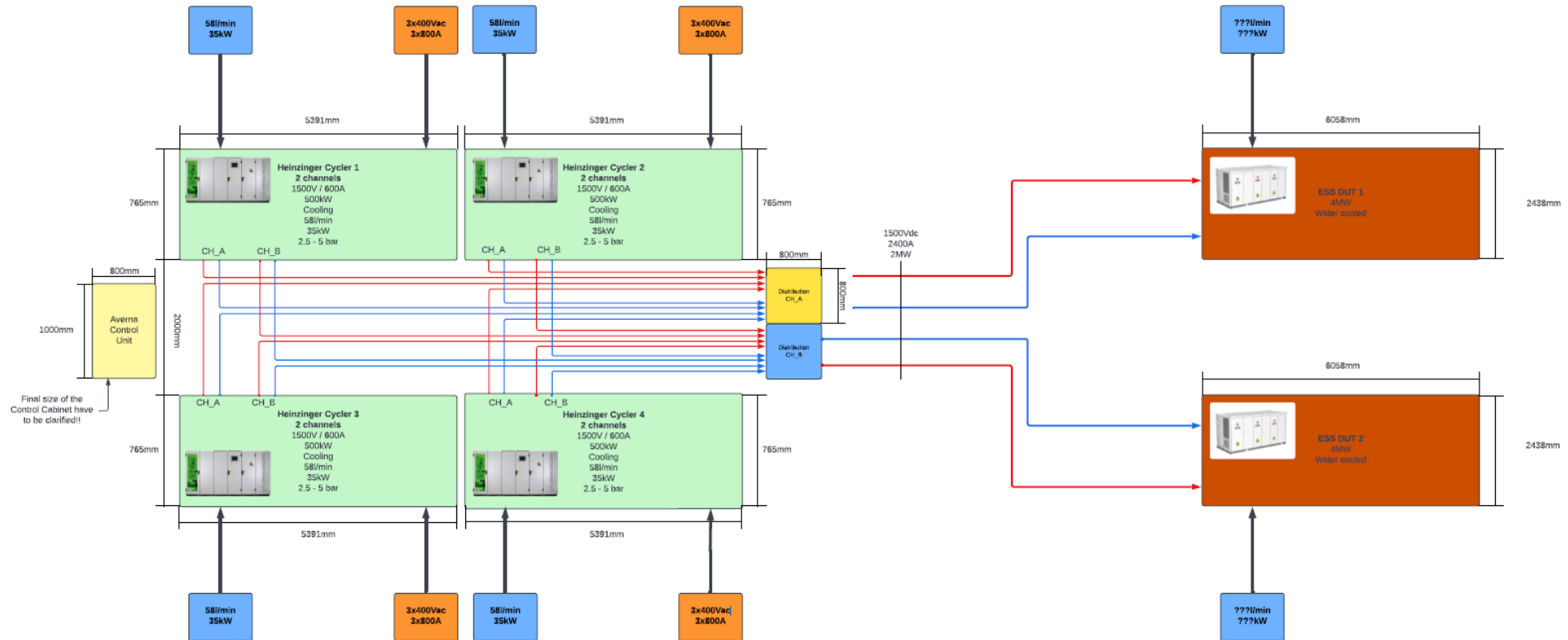
Rack 07# // ERS 2::CH 2				
Heinzinger ERS				
Voltage	352,8			
Current	-170,0 A			
Power	-59,9 kW			
BMS				
Voltage Pack 1	118,6 V			
Voltage Pack 2	118,3 V			
Voltage Pack 3	118,3 V			
SOC	50,0 %			
	Min	Max	Delta	Cell-No
Cell Voltage	3,271 V	3,290 V	0,019 V	Min: 80 / Max: 75
Temperature	21,0 °C	22,0 °C	1,0 °C	Min: 3 / Max: 1
Sequence				
Test started	10.01.2024 15:29:49			
Test finished				
Result				
1 connect				
2 pause	60s			
3 charge	CC: 378.0V, 238.0A, 95.0kW / 136.0A, 180s			
4 pause	60s			
5 discharge	CC: 270.0V, 170.0A, 125.0kW / 17.0A, 180s			
6 pause	60s			
7 disconnect				

Pack line– application



ESS performance test – application

Concept



Batterie Inspektor – standard framework

standardized solution from pack to application



- Standardized system and technology
- Flexibel DBC handling
- scalable in terms of number of channels
- Flexibel in integration of different sensors
- Simulating BMS in integrated CAN device
- Comparability of data
- Exchangeable interfaces to EMS and PLC

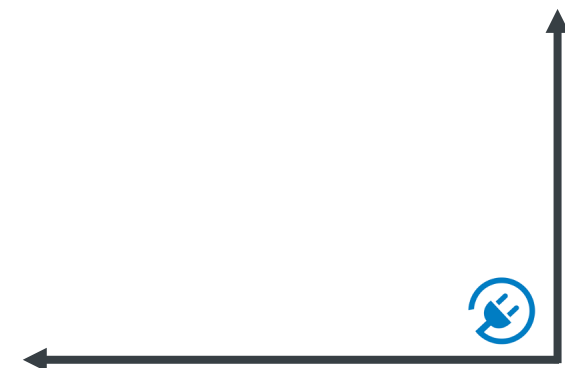
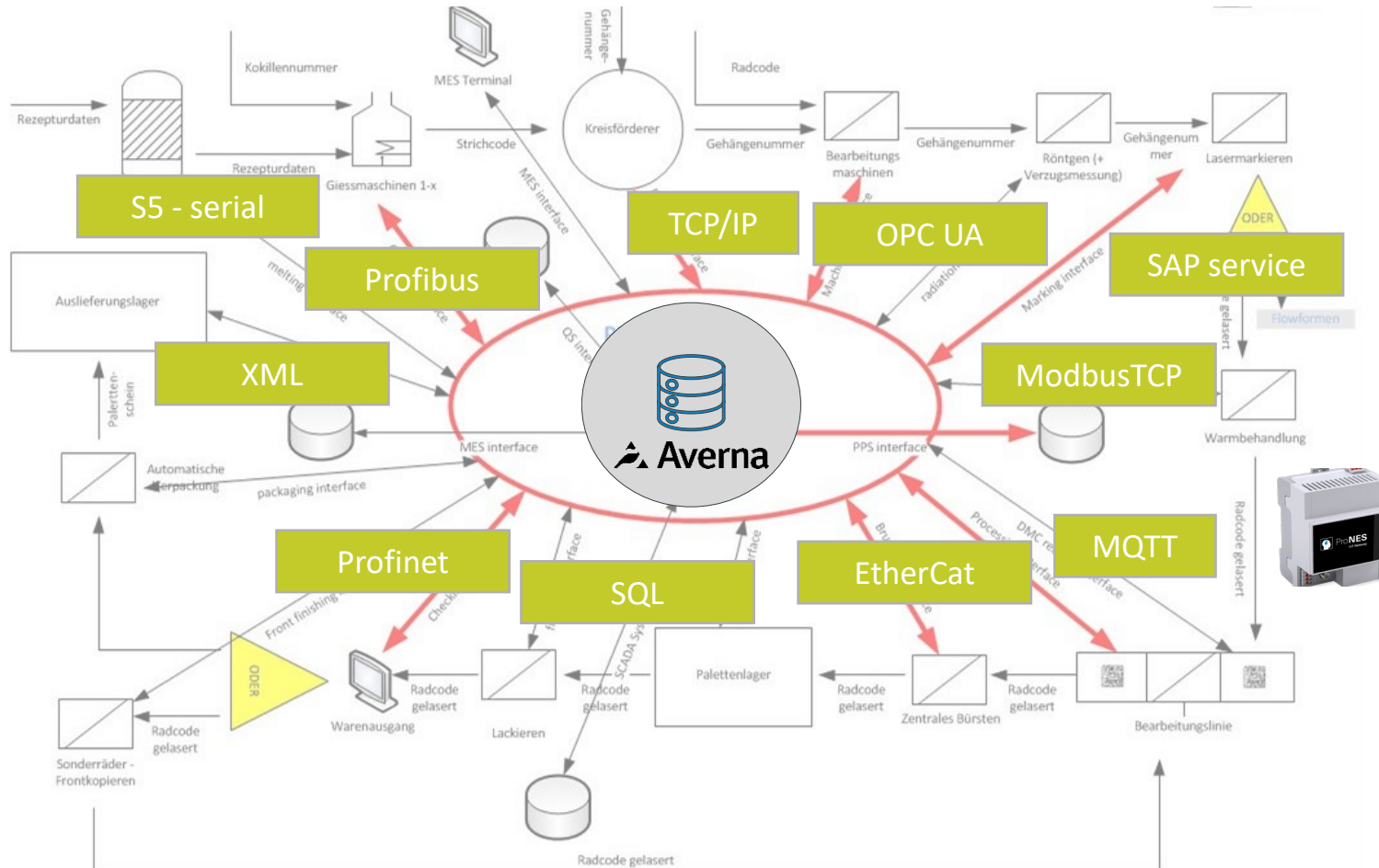


Batterie Inspektor – standard framework

Benefit of standardized solutions

- Tried-and-tested system architecture
- Leverage off-the-shelf components from market leader NI
- Full integration into customer-specific system environment
- Stable, reliable, turnkey solutions in 24/7 quality
- Reduction of maintenance costs
- Interchangeability with existing systems is guaranteed
- Fully tested and certified components
- CE, UL, EN61010 safety assessment, insulation test according to VDE0100, risk analysis available
- Worldwide support through global service structures
- Same team deliveries maintenance and support all over the world
- Capacity transfer in the same structures and company
- Speed up deployment and multiplying

Batterie Inspektor – ready for Iot



Vielen Dank

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