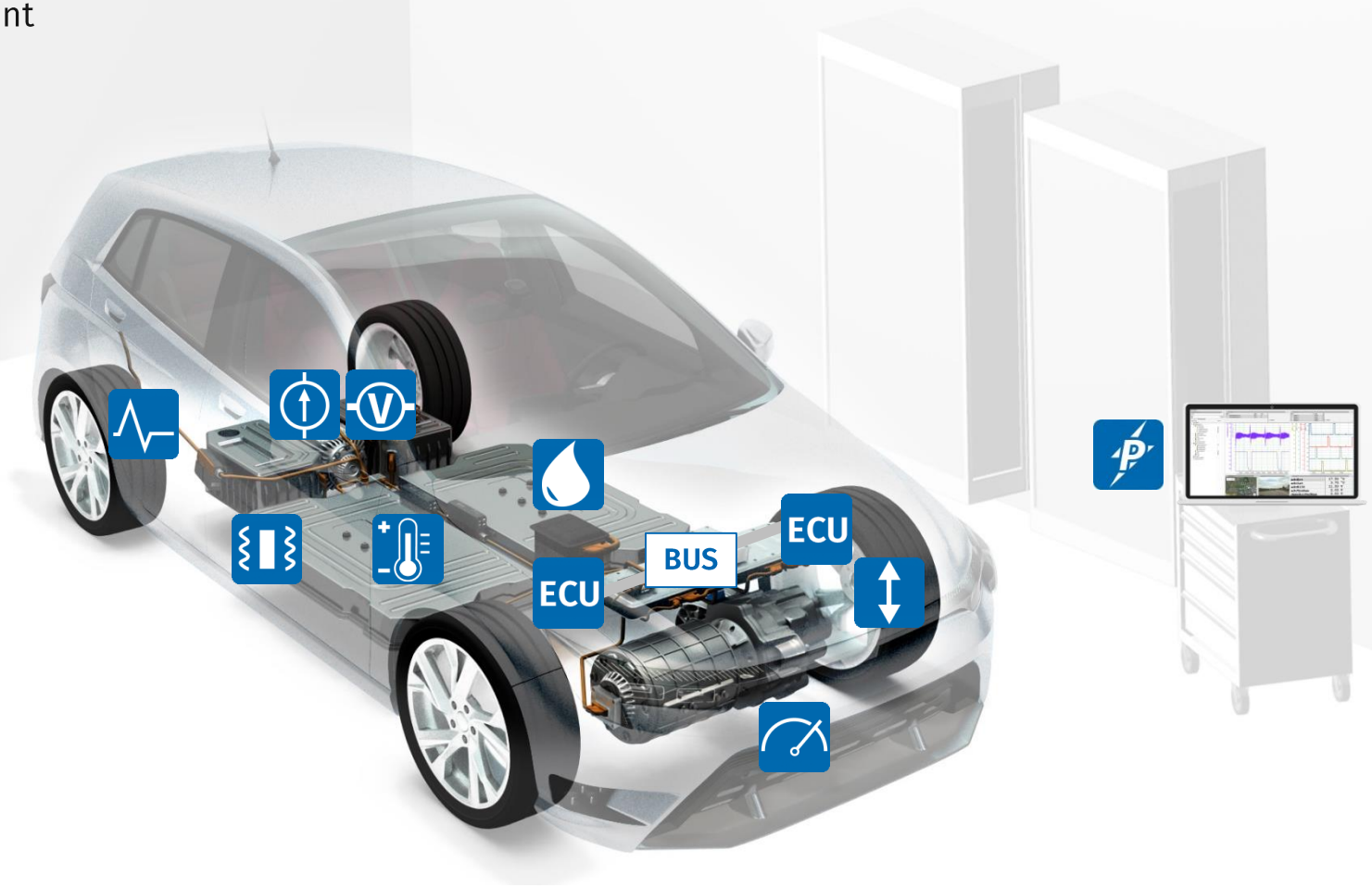
The Vector CSM E-Mobility Measurement System

CSM Web Seminars

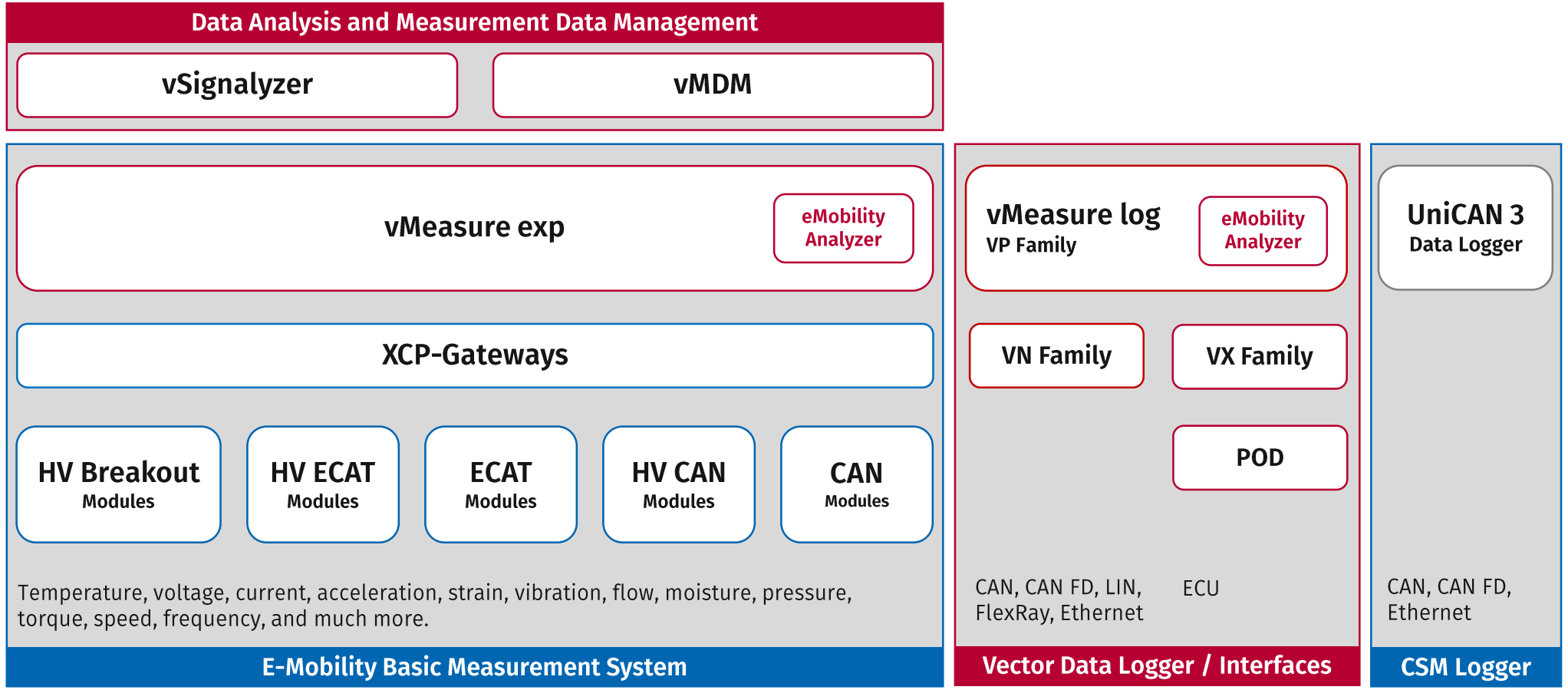
Innovative Measurement and Data Technology

Challenges for measurement technology

- Distributed measurement points
  - decentralized and modular measurement system
- Synchronous acquisition of physical measurement variables
  - Power measurement requires 100% synchronous sampling of current and voltage
- Synchronous acquisition of ECU data and bus data
- Autonomous acquisition, processing and storage of measurement data streams



The Vector CSM E-Mobility Measurement System



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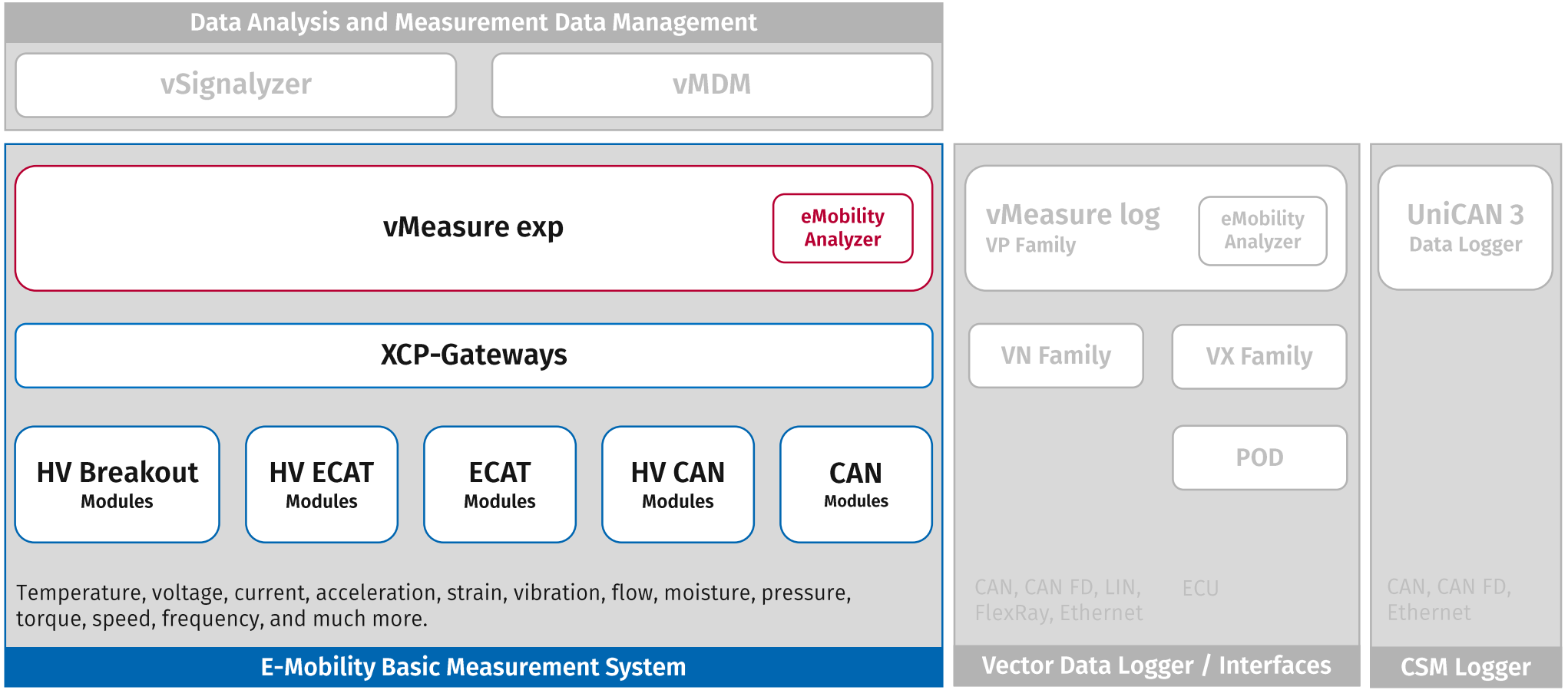
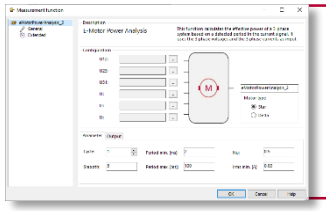


E-Mobility Basic Measurement System

Data acquisition, visualization, online data processing and synchronization

vMeasure exp



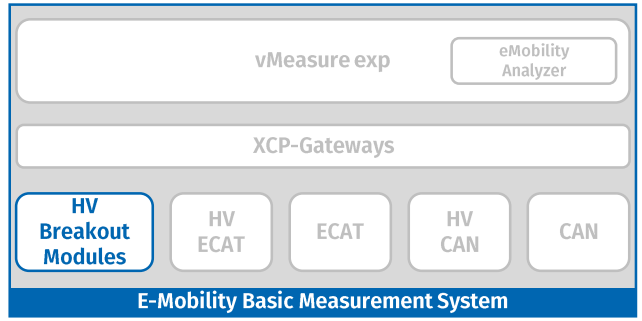
eMobility Analyzer

Temperature, voltage, current, acceleration, strain, vibration, flow, moisture, pressure, torque, speed, frequency, and much more.

E-Mobility Basic Measurement System

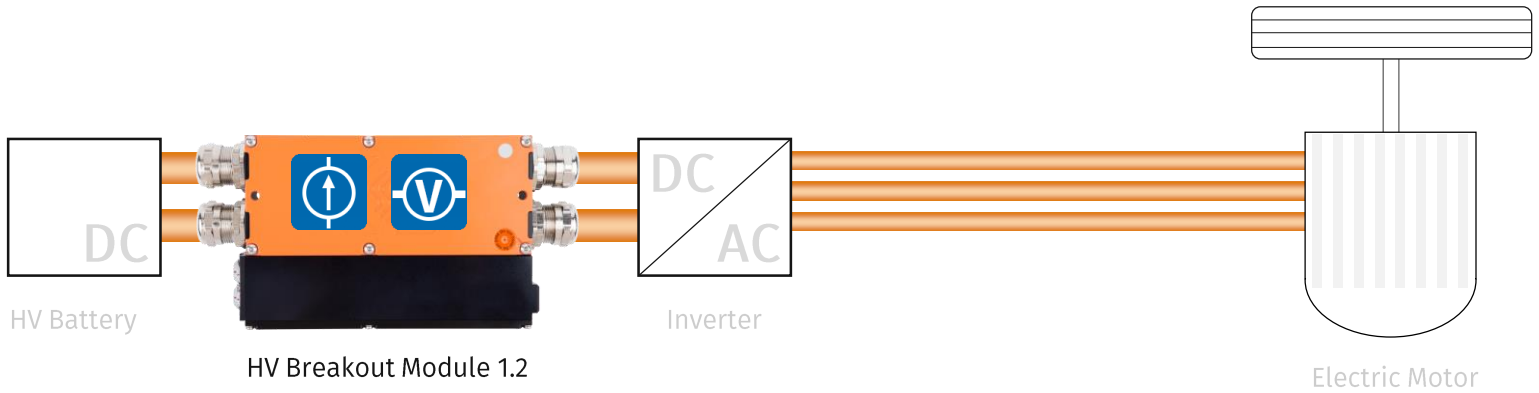
E-Mobility Basic Measurement System

Acquisition of physical measurement variables



Testing of an electric power train

- Synchronous measurement of current and voltage between HV battery and inverter



Find
HV Breakout Modules
on www.csm.de

E-Mobility Basic Measurement System

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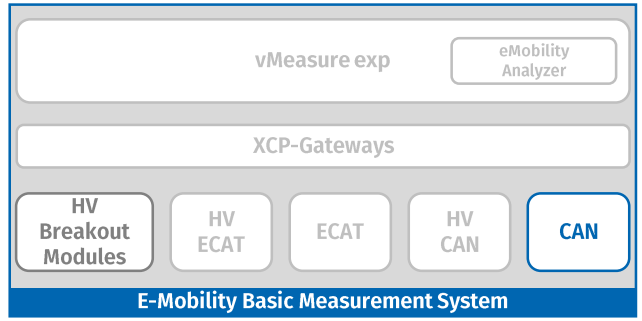
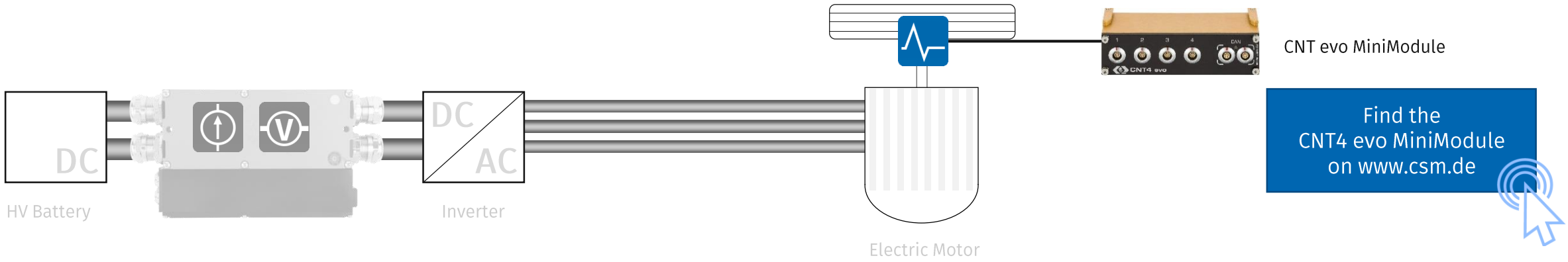


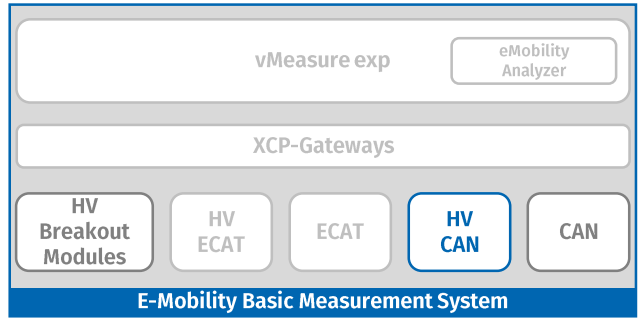
Testing of an electric power train

- Synchronous measurement of current and voltage between HV battery and inverter
- Acquisition of speed and torque



E-Mobility Basic Measurement System

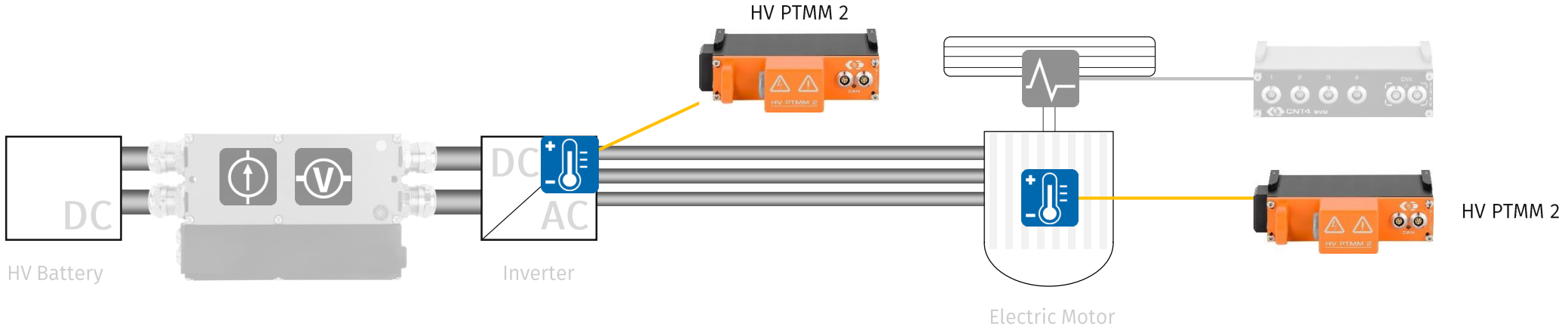
Acquisition of physical measurement variables



Testing of an electric power train

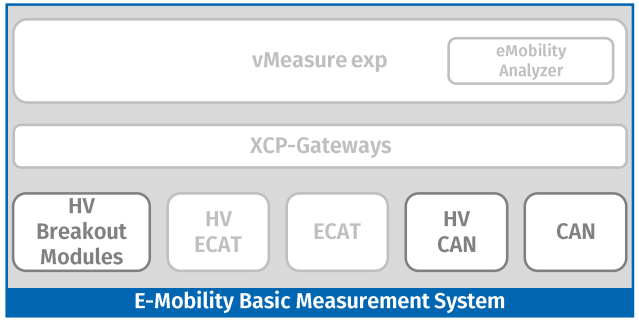
- Synchronous measurement of current and voltage between HV battery and inverter
- Acquisition of speed and torque
- Parallel temperature measurements in inverter and electric motor

Find HV-safe temperature measurement modules on www.csm.de



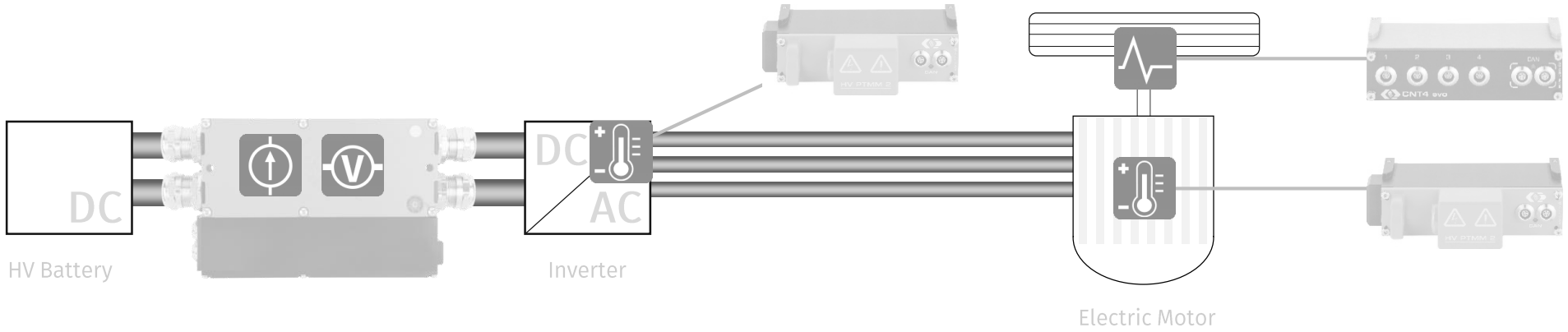
E-Mobility Basic Measurement System

Acquisition of physical measurement variables



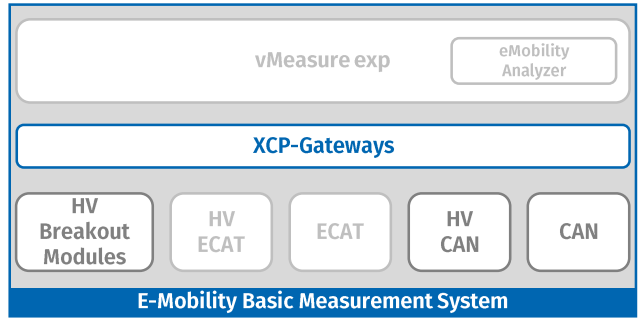
Testing of an electric power train

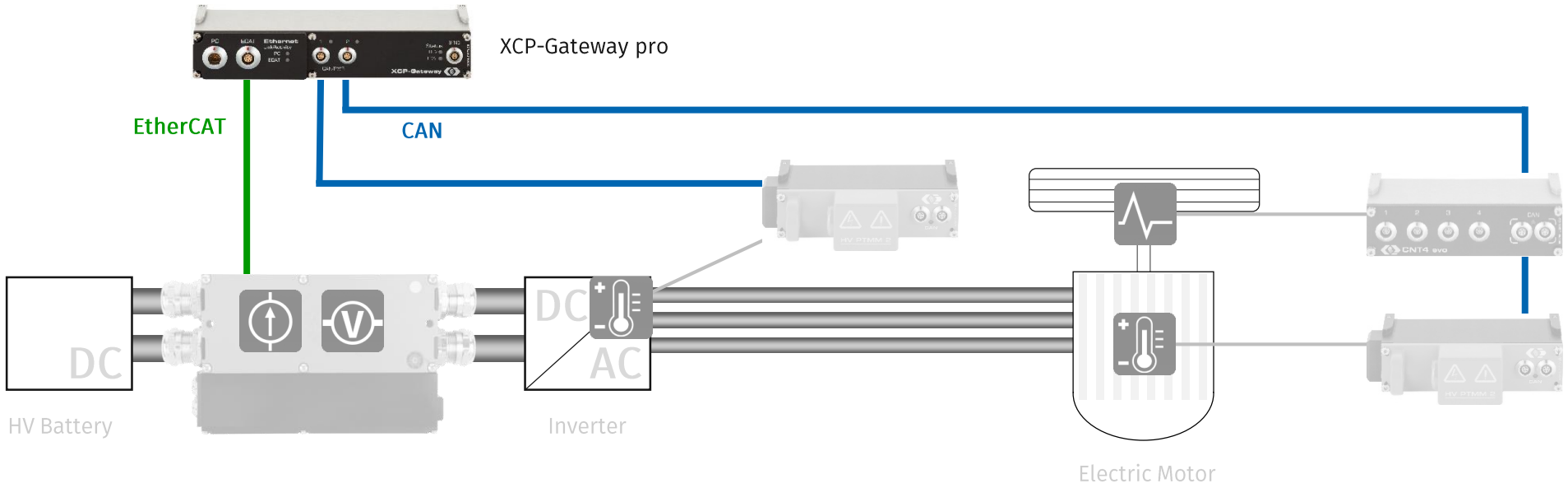
- Synchronous measurement of current and voltage between HV battery and inverter
- Acquisition of speed and torque
- Parallel temperature measurements in inverter and electric motor
- Calculation of the efficiency of the powertrain in real time



E-Mobility Basic Measurement System

Acquisition of physical measurement variables



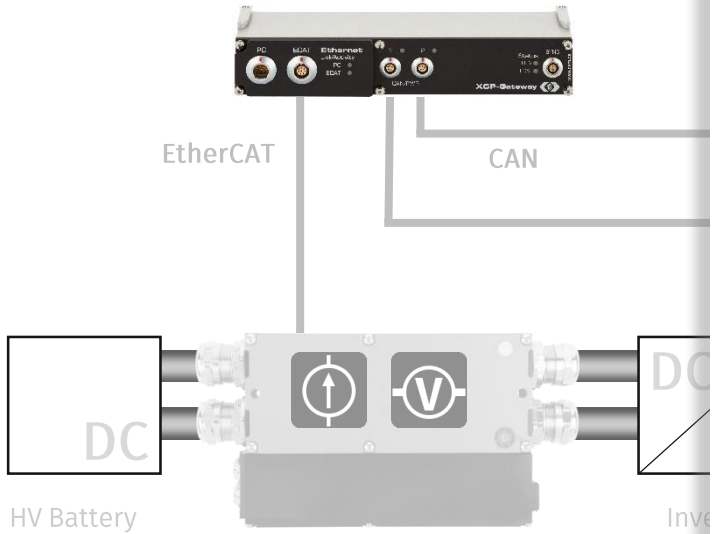


XCP-Gateway

Explore the XCP-Gateway on www.csm.de

Synchronization and bundling

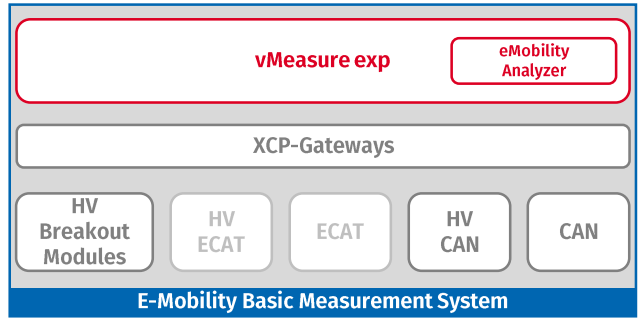
- EtherCAT® Master: Time synchronization for all EtherCAT modules (1 µs)
- XCP-on-Ethernet slave with PTP (IEEE1588) time synchronization
- 1 or 4 EtherCAT ports
- 2 CAN ports
- 1 Ethernet port to PC

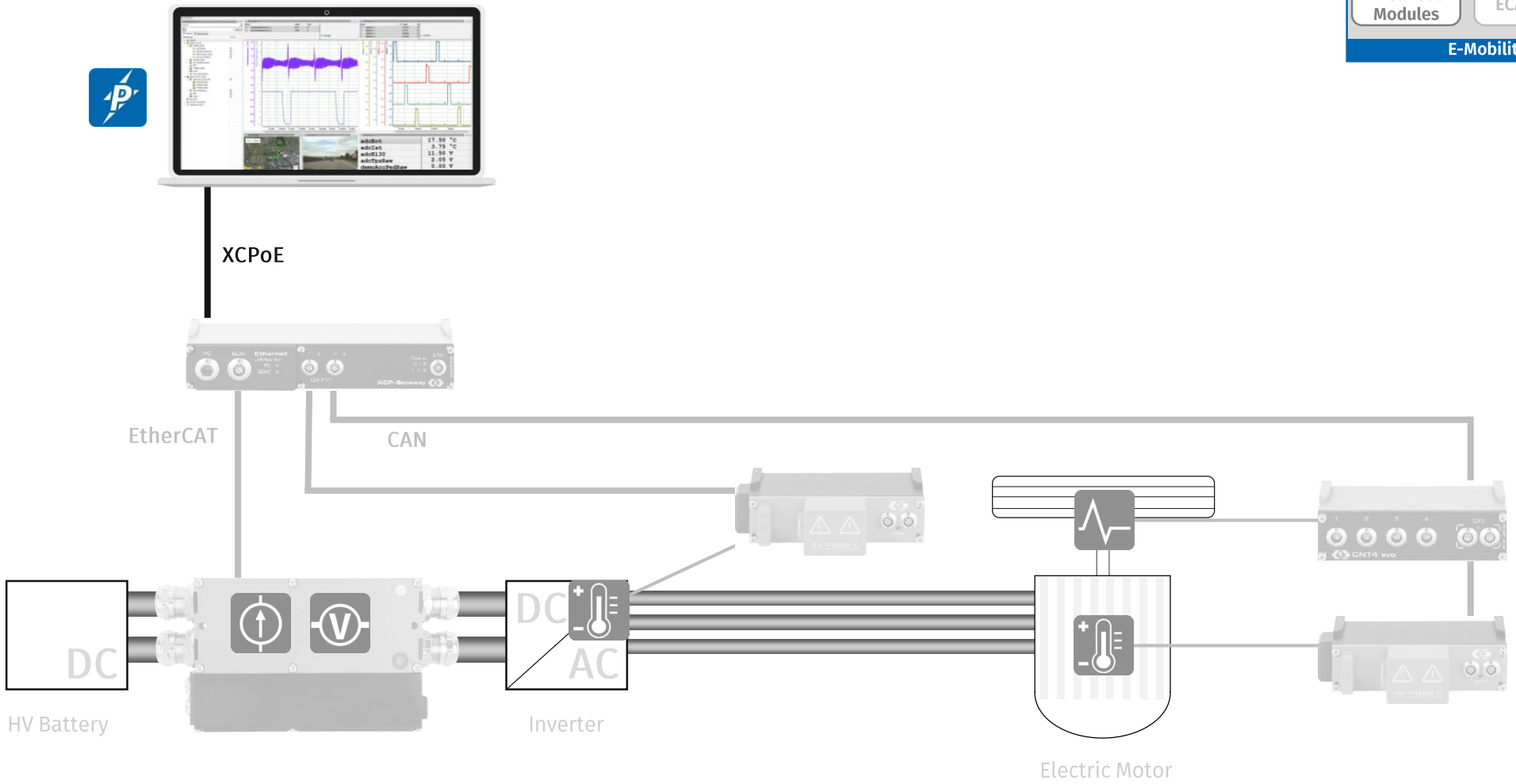


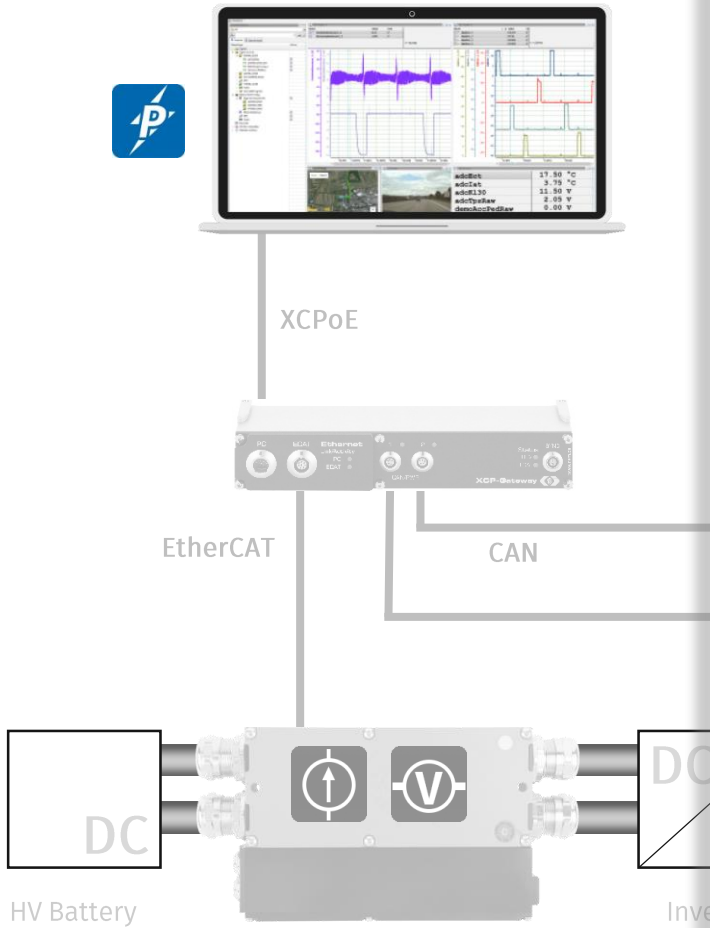
XCP-Gateway 4S pro

E-Mobility Basic Measurement System

Calculation of physical measurement values





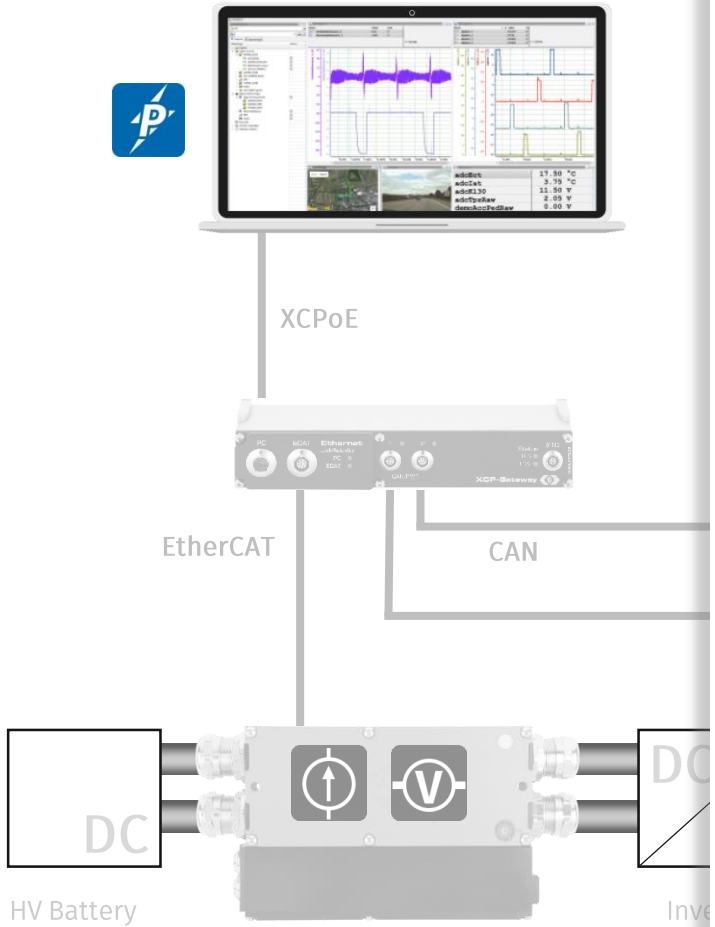


vMeasure exp – Data acquisition software

- Multithreading functionality
- Time synchronized data acquisition from
  - CSM measurement modules (HV BM, ECAT, CAN)
  - Vehicle buses (Ethernet, Flexray, CAN FD, ...)
  - ECUs
  - video, GPS
- Online calculations and scripting
- Multiple visualization

E-Mobility Basic Measurement

Calculation of physical measurement

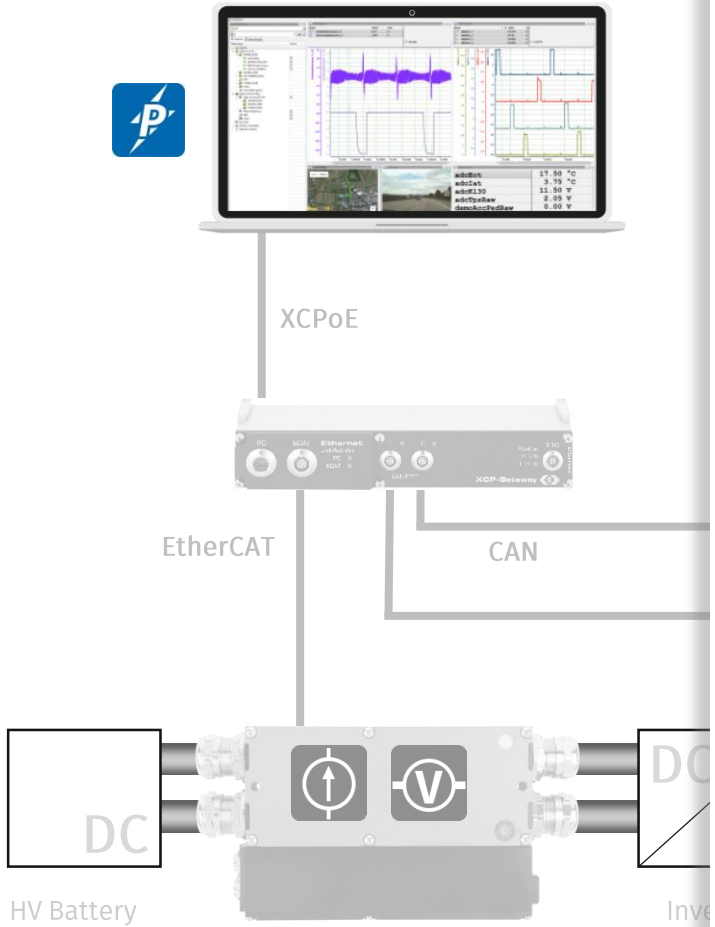


eMobilityAnalyer - Function library

The eMobilityAnalyzer enables real-time analysis of

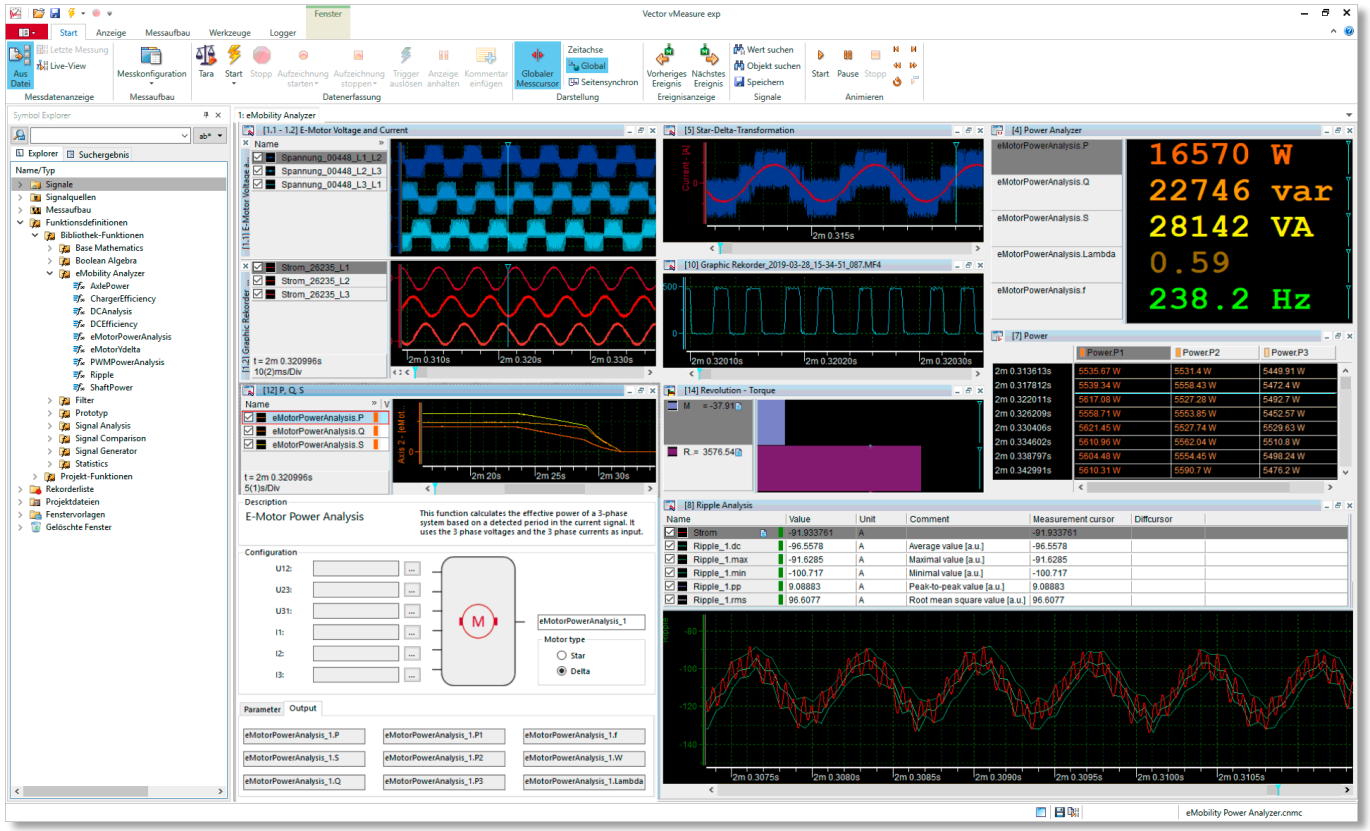
- DC/AC voltages and currents
  - Ripple, Slope, TrueRMS, ...
- Power analysis
  - Active power, apparent and reactive power, power factor
- Harmonic analysis
- PWM analysis
- Mechanical power and axis power
- Energy consumption
- Efficiency
- Inverter, charging system, e-motor

All measurement data are also **available for offline data processing**.

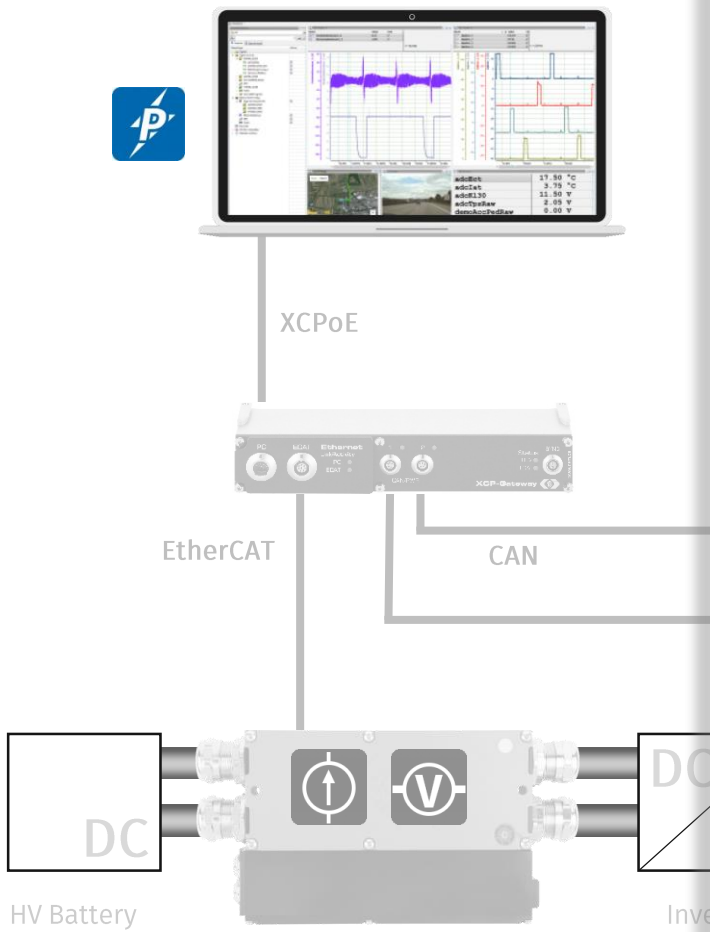


eMobilityAnalyer - Function library

The eMobilityAnalyzer is a function library that is optimally harmonized with the CSM measurement modules.



E-Mobility Basic Measuremen
Calculation of physical measurement



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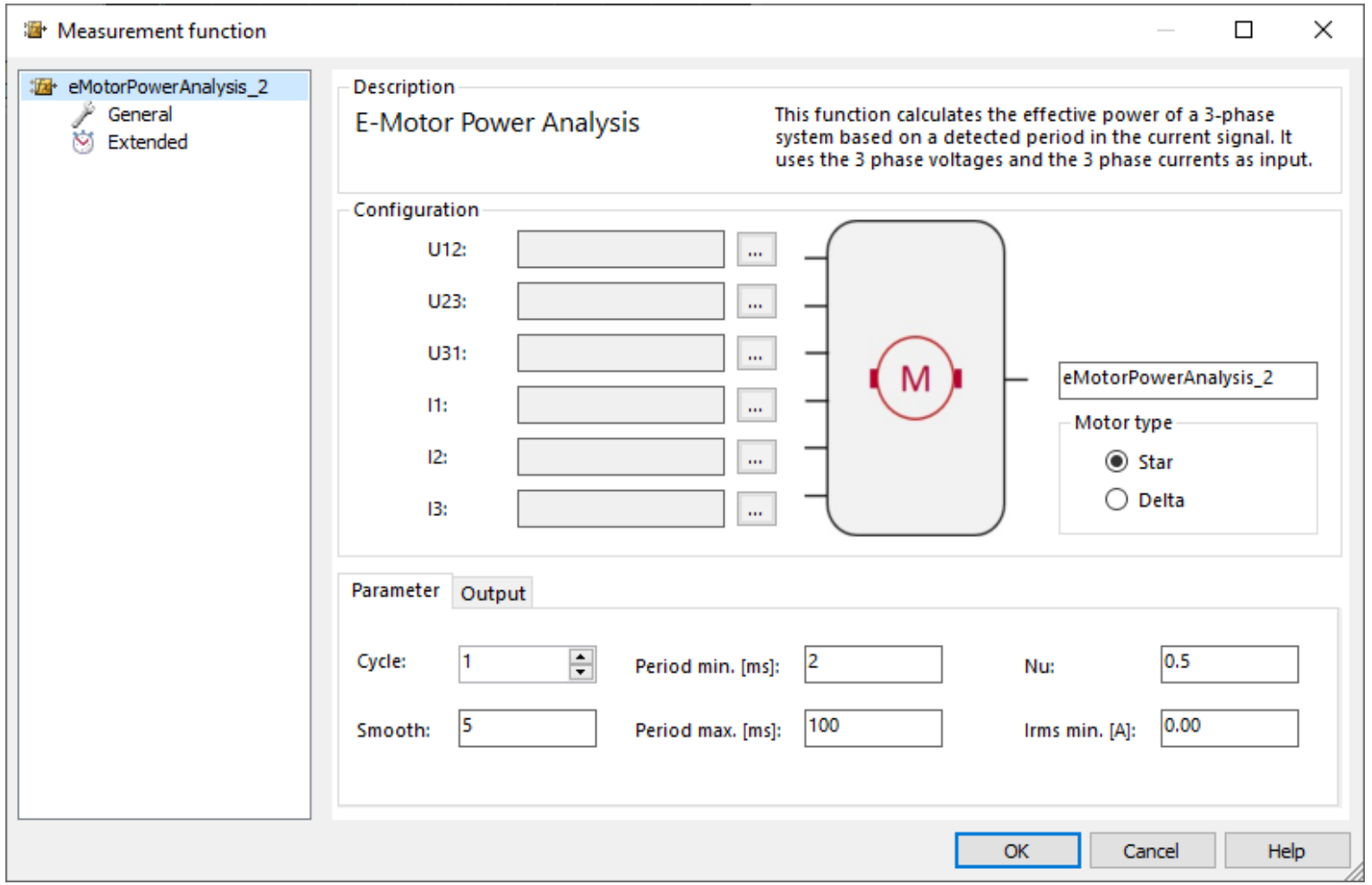
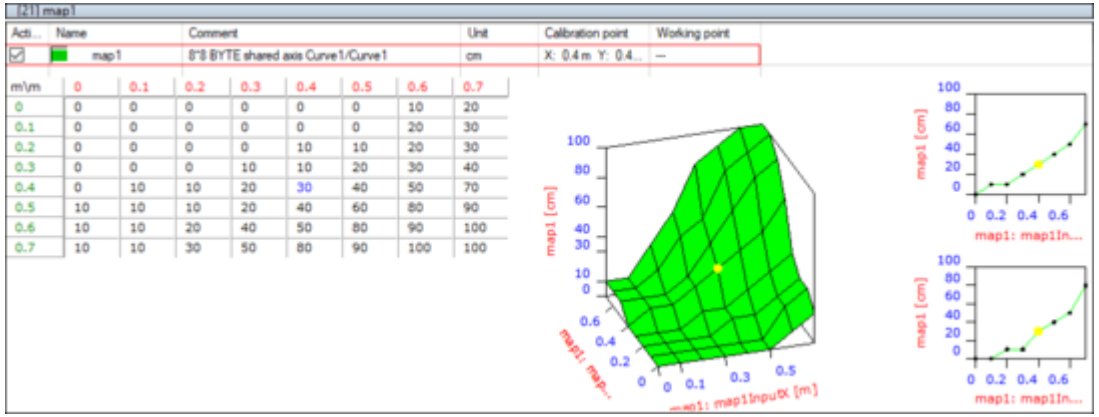


The Vector CSM E-Mobility Measurement System with CANape

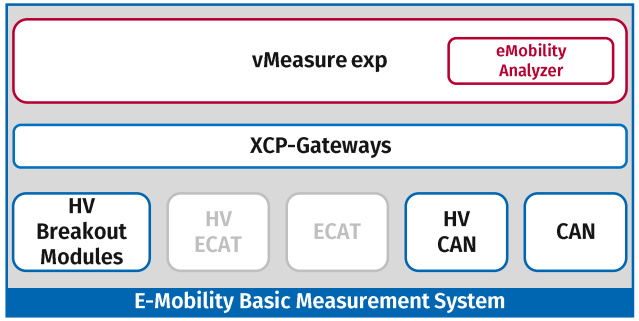
- All functions of the measurement system are also available in CANape
- Same user interface as vMeasure exp
- eMobility Analyzer is integrated in CANape
- Smart Logger with CANape log
- Additionally: ECU calibration / characteristic adjustment



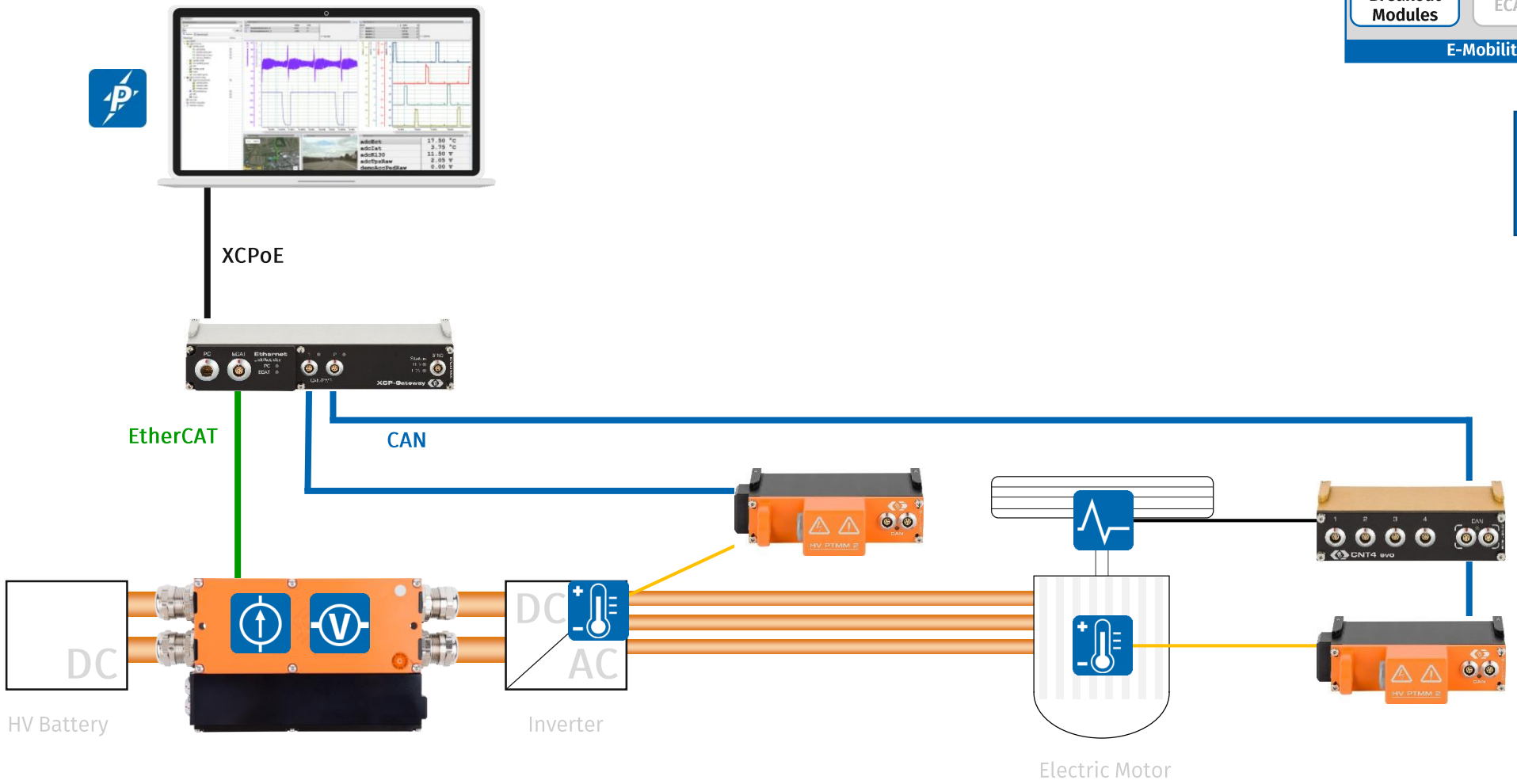
Numerical and graphical adjustment window allows convenient adjustment of characteristic curves and fields

E-Mobility Basic Measurement System

Calculation of physical measurement values



Read the application example on www.csm.de



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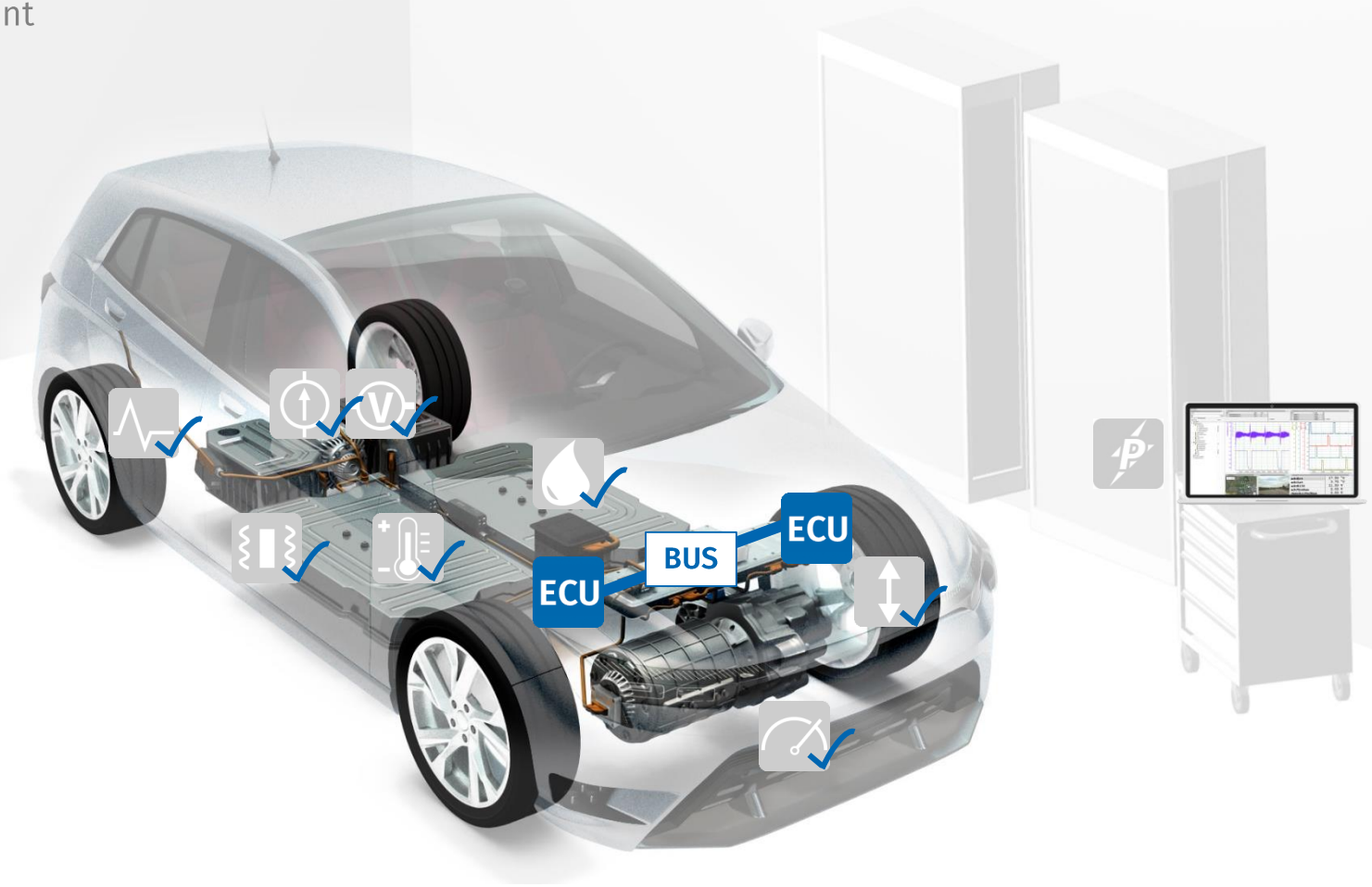

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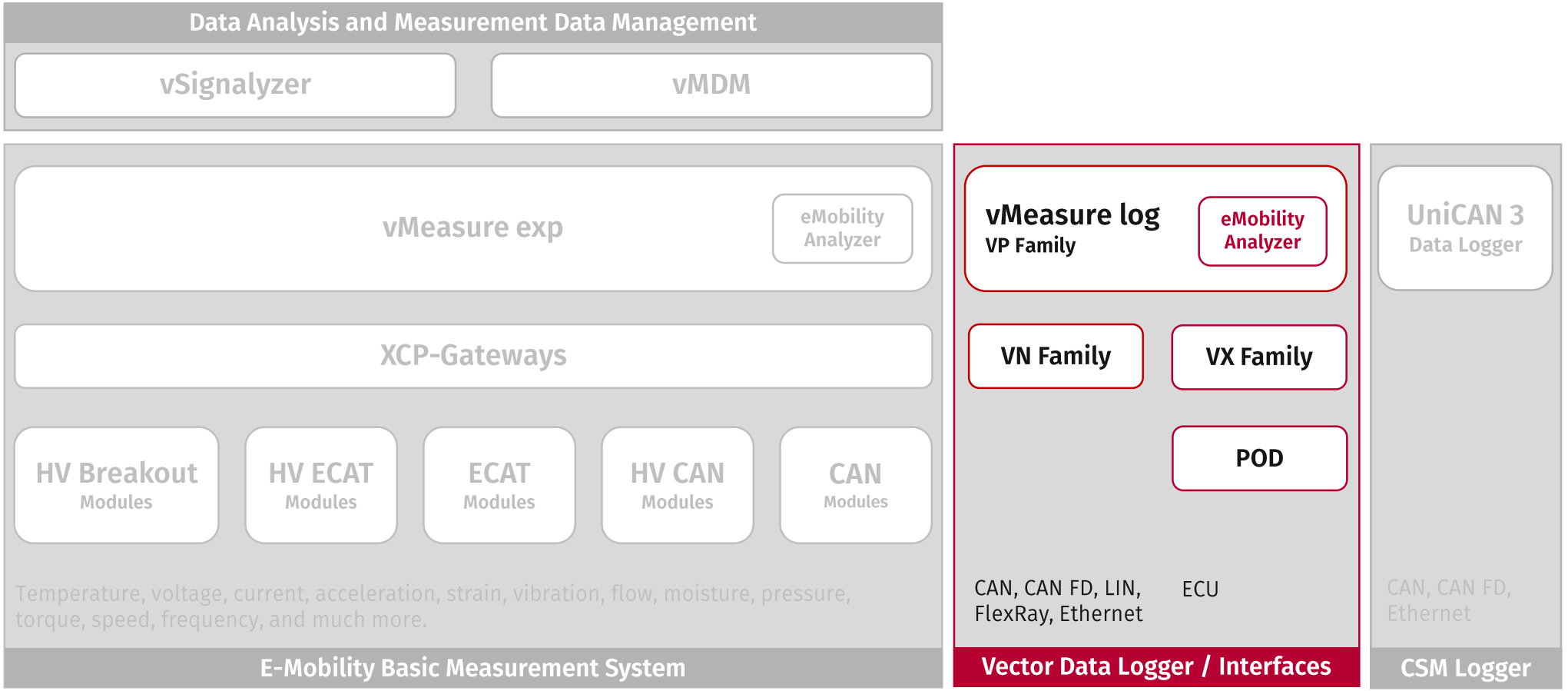
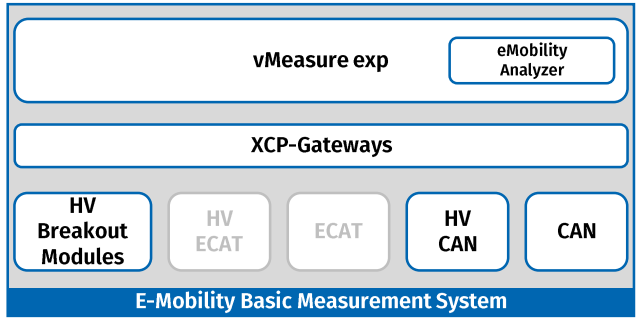
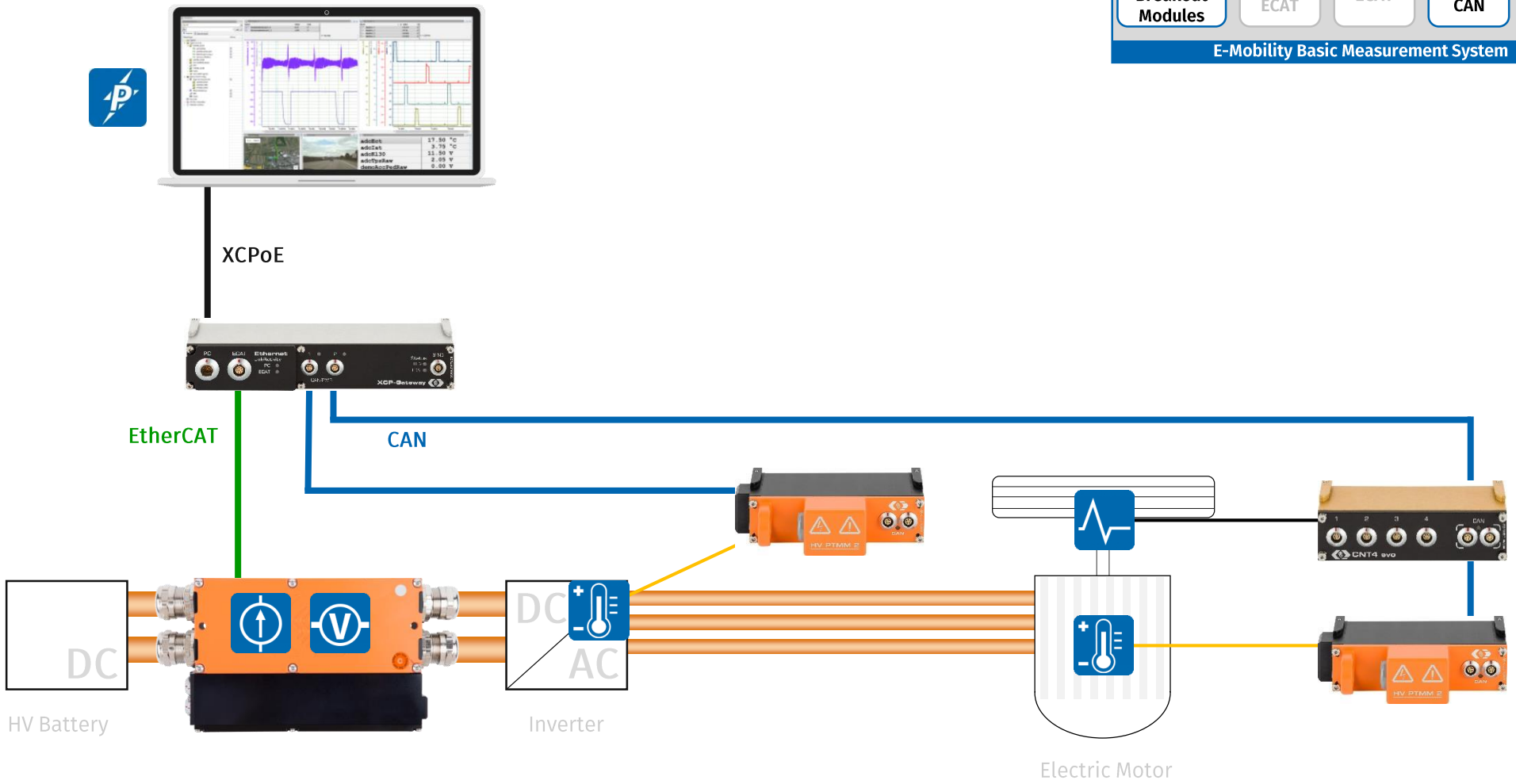


Basic measurement system + ECU data

Additional acquisition of data from control units





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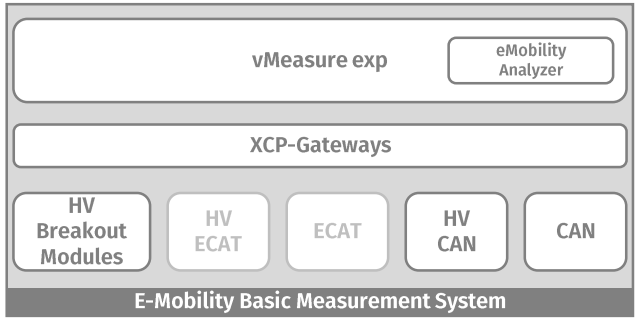

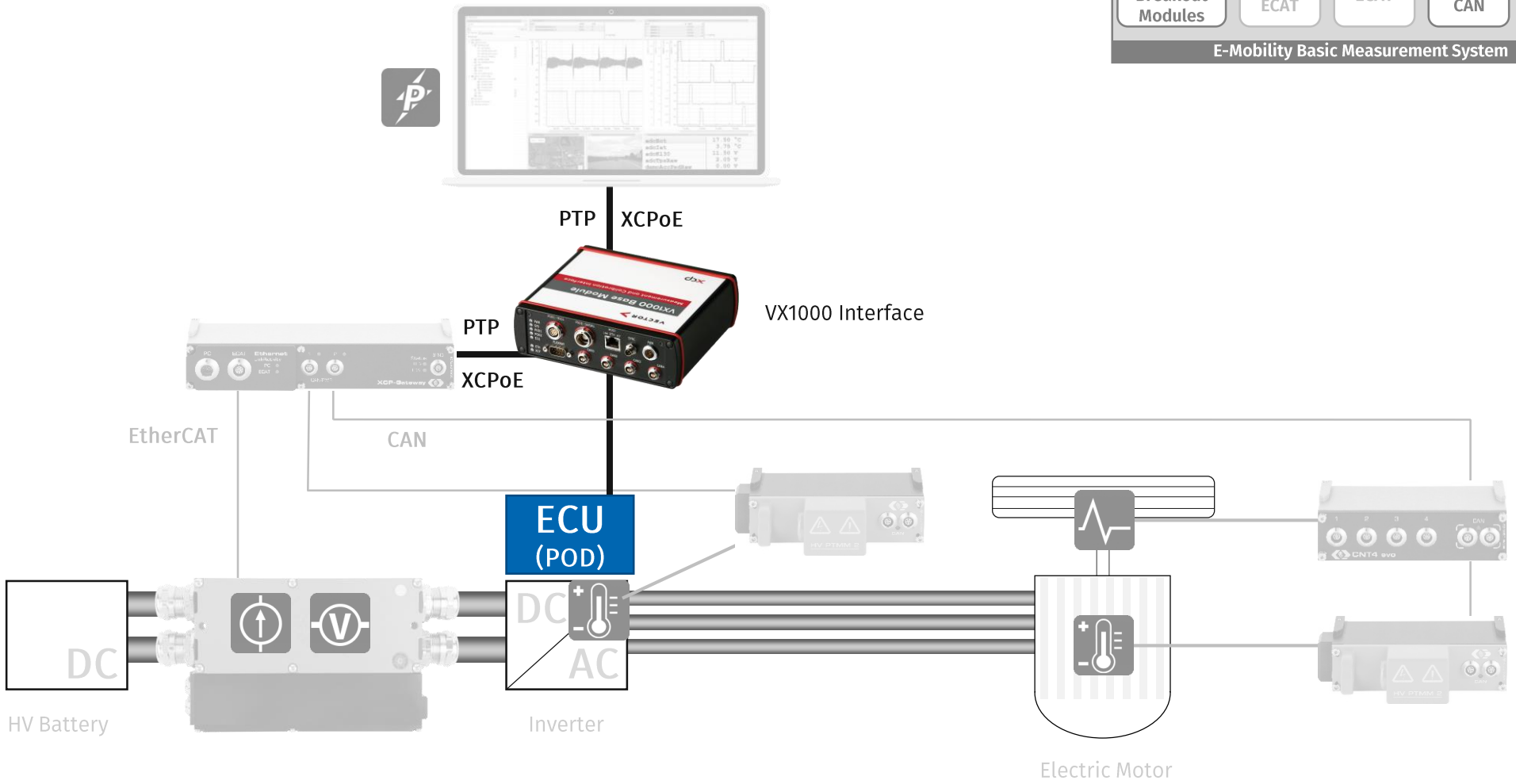

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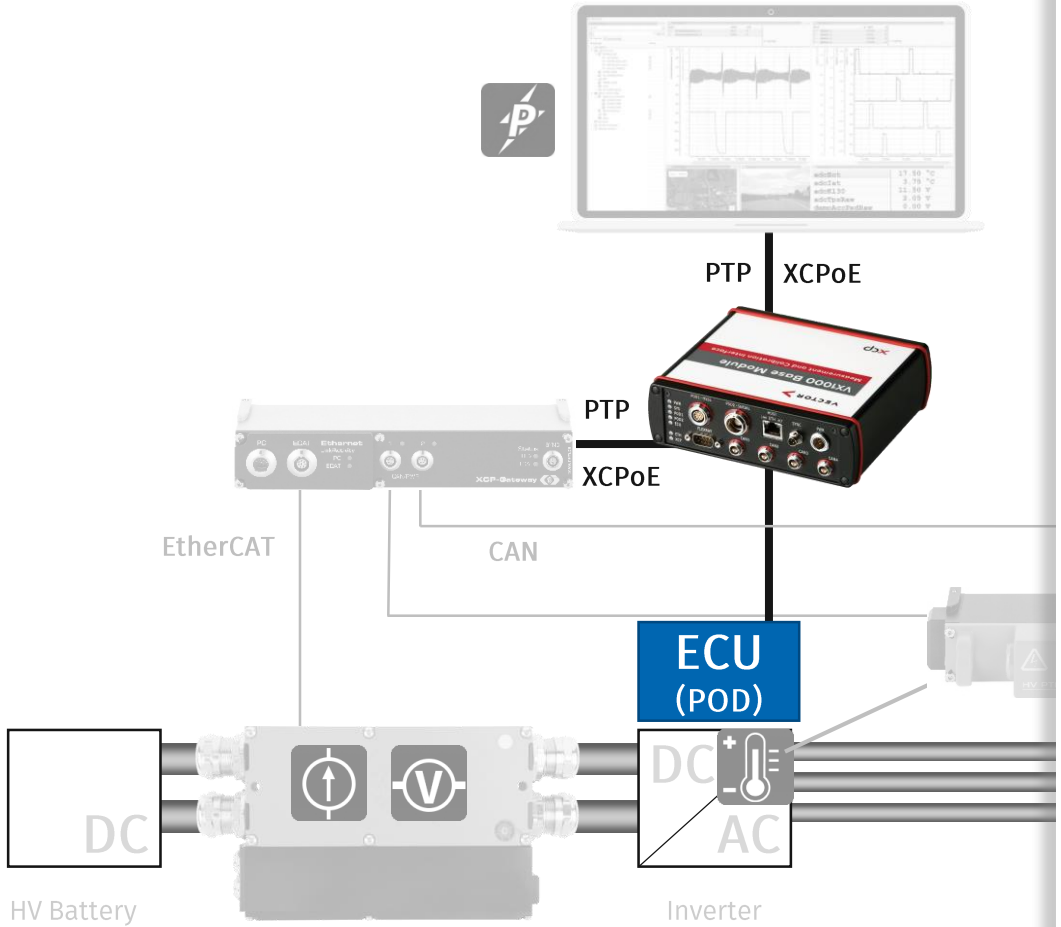
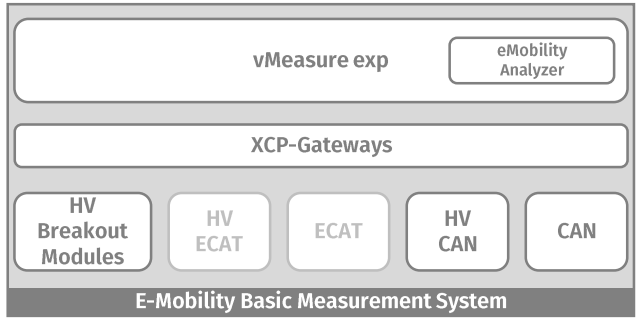


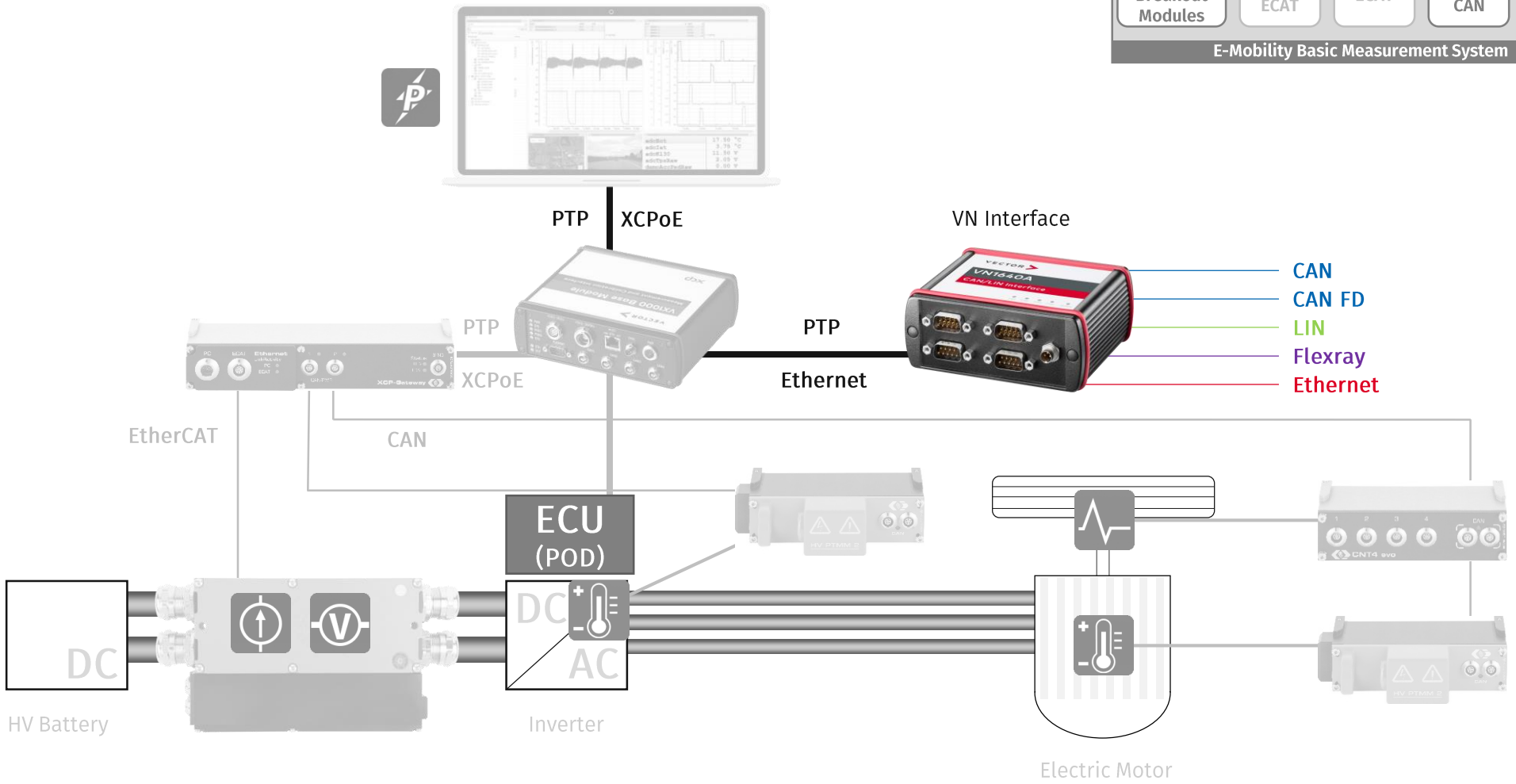
VX Family

- ECU measurement and calibration
- Interfaces between ECUs and vMeasure exp
- Can measure multiple ECUs simultaneously
- POD (Plug on Device) interfaces are available for numerous microcontroller debug ports
- Measurement data, bus data and ECU data can be measured simultaneously and synchronously
- PTP Slave

Basic measurement system + ECU data + bus data

Additional acquisition of measurement data from vehicle buses

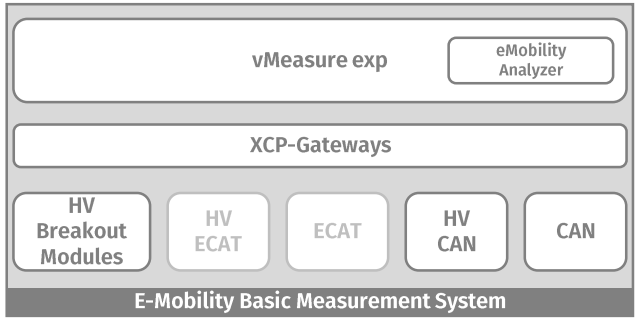


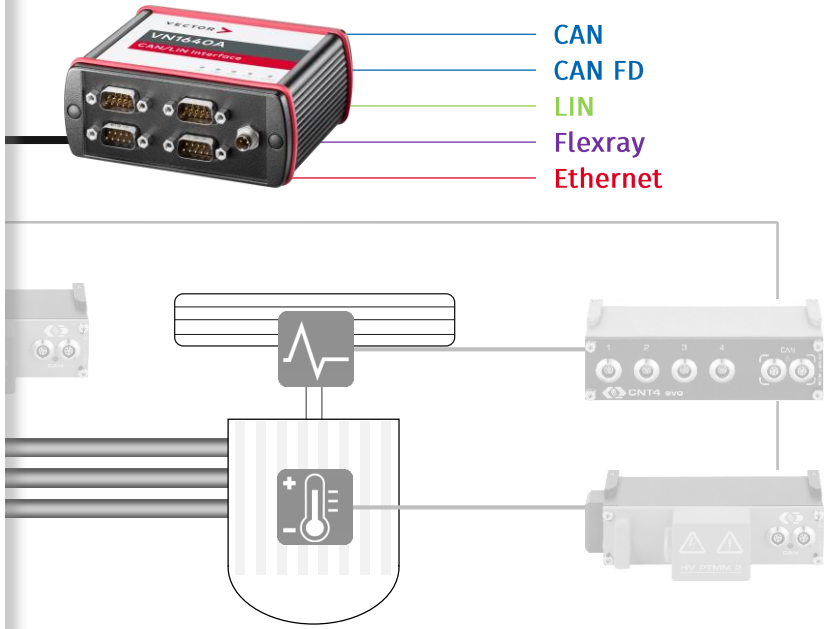


VN Family

- Interfaces for all automotive bus systems
- Time synchronous, low jitter and high bandwidth
  - CAN, CAN FD, FlexRay, Ethernet, LIN, Most

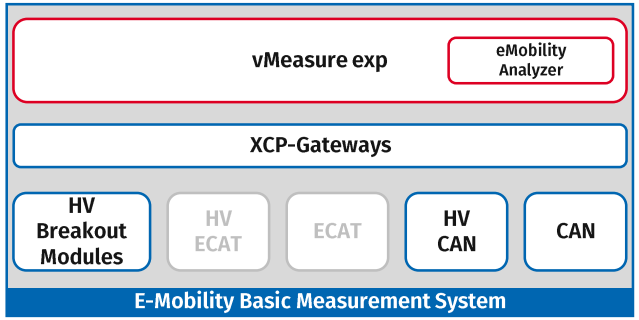
bus data
buses

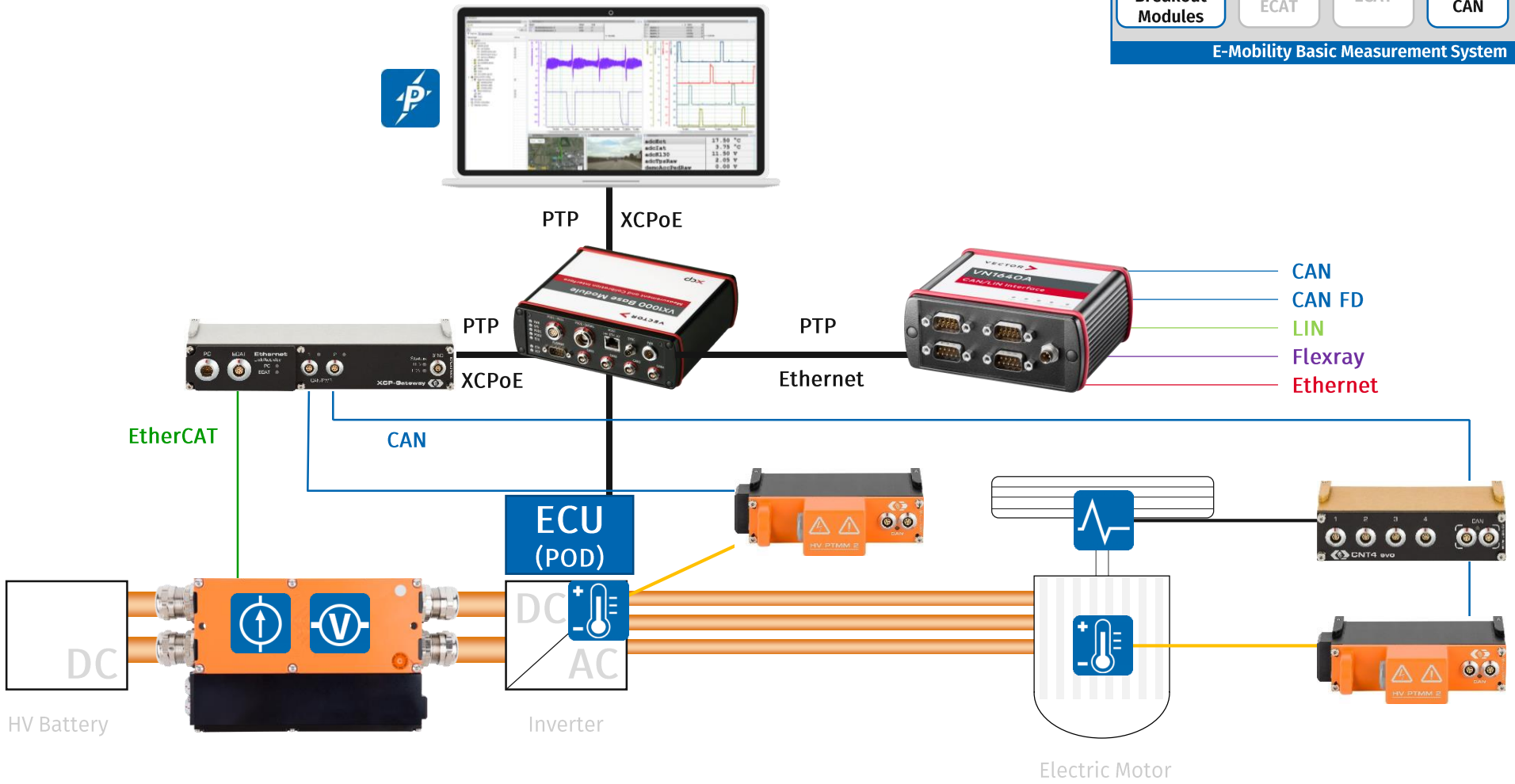




Basic measurement system + ECU data + bus data

Additional acquisition of measurement data from vehicle buses





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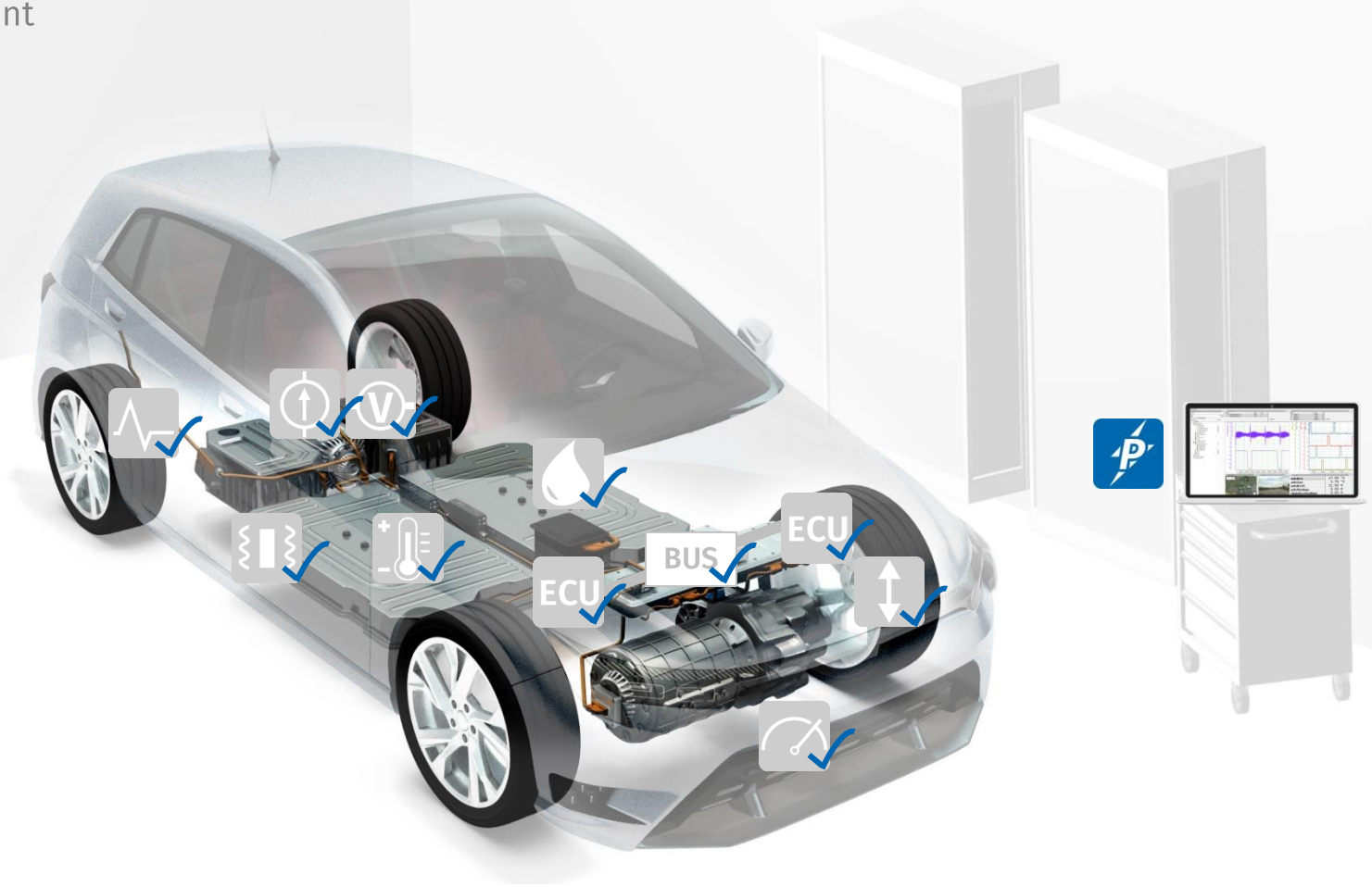
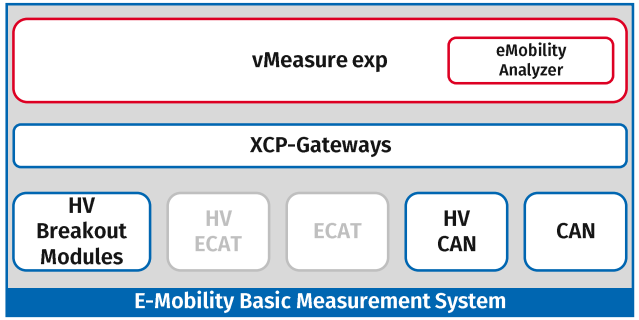
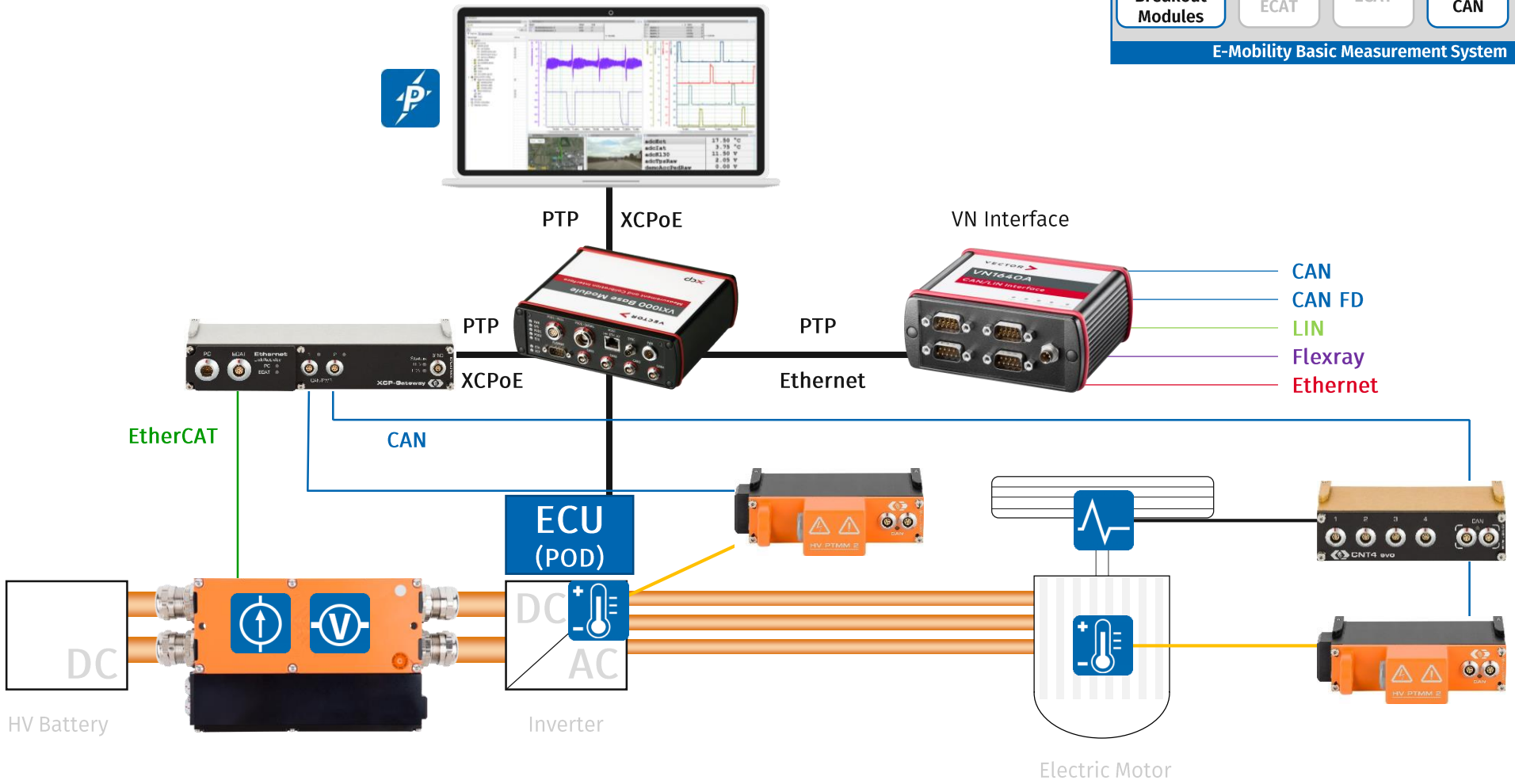


Autonomous measurement data acquisition

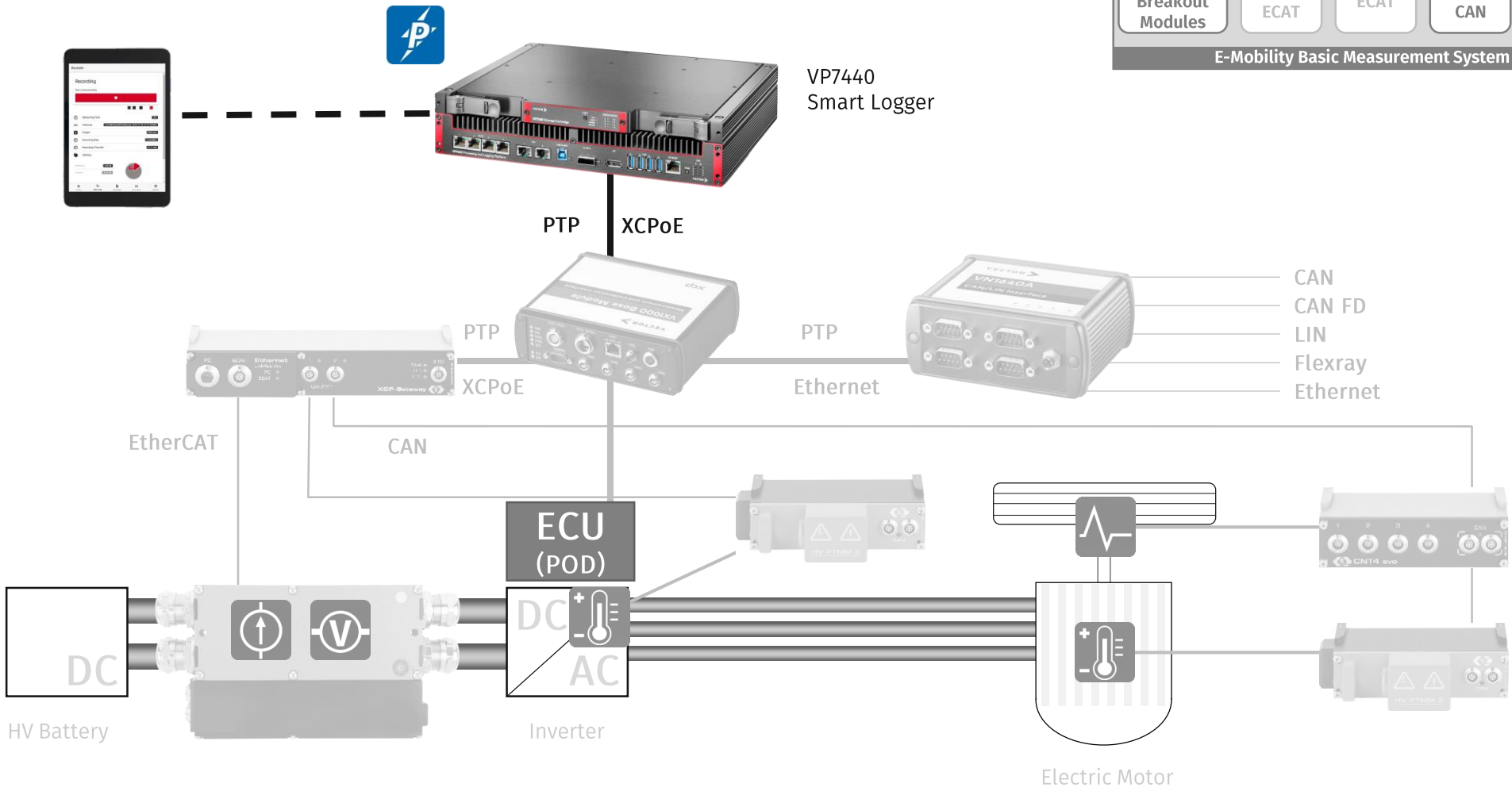
Processing and storage

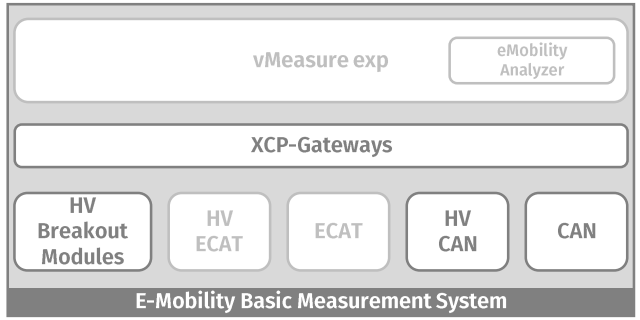


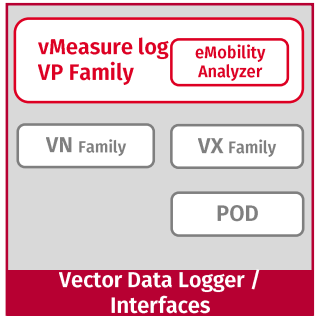


Autonomous measurement data acquisition

Processing and storage

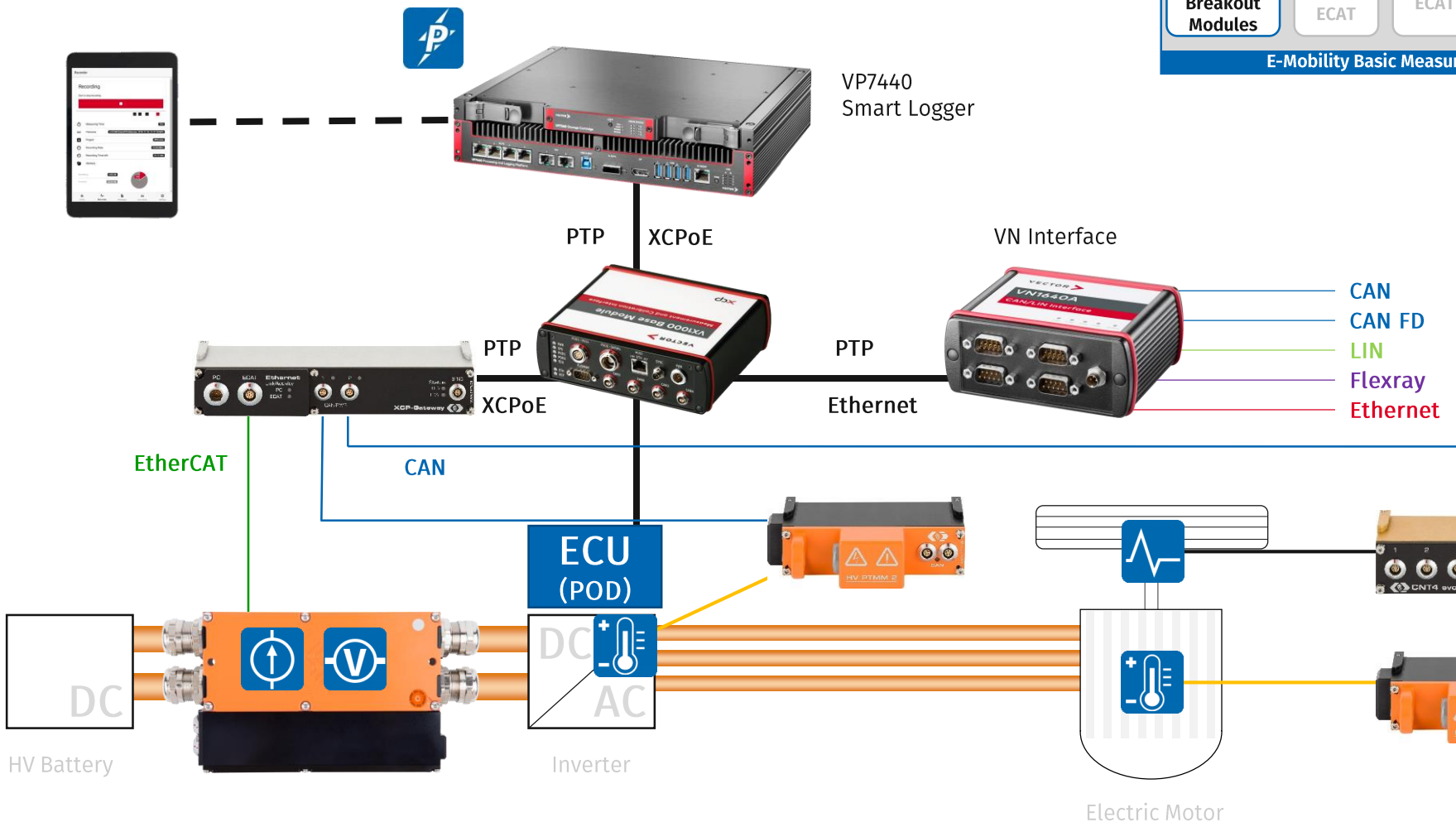


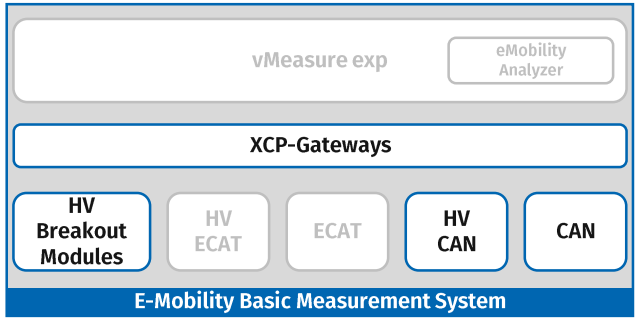


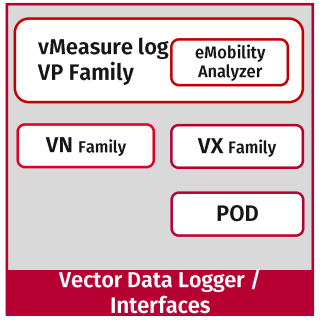


Autonomous measurement data acquisition

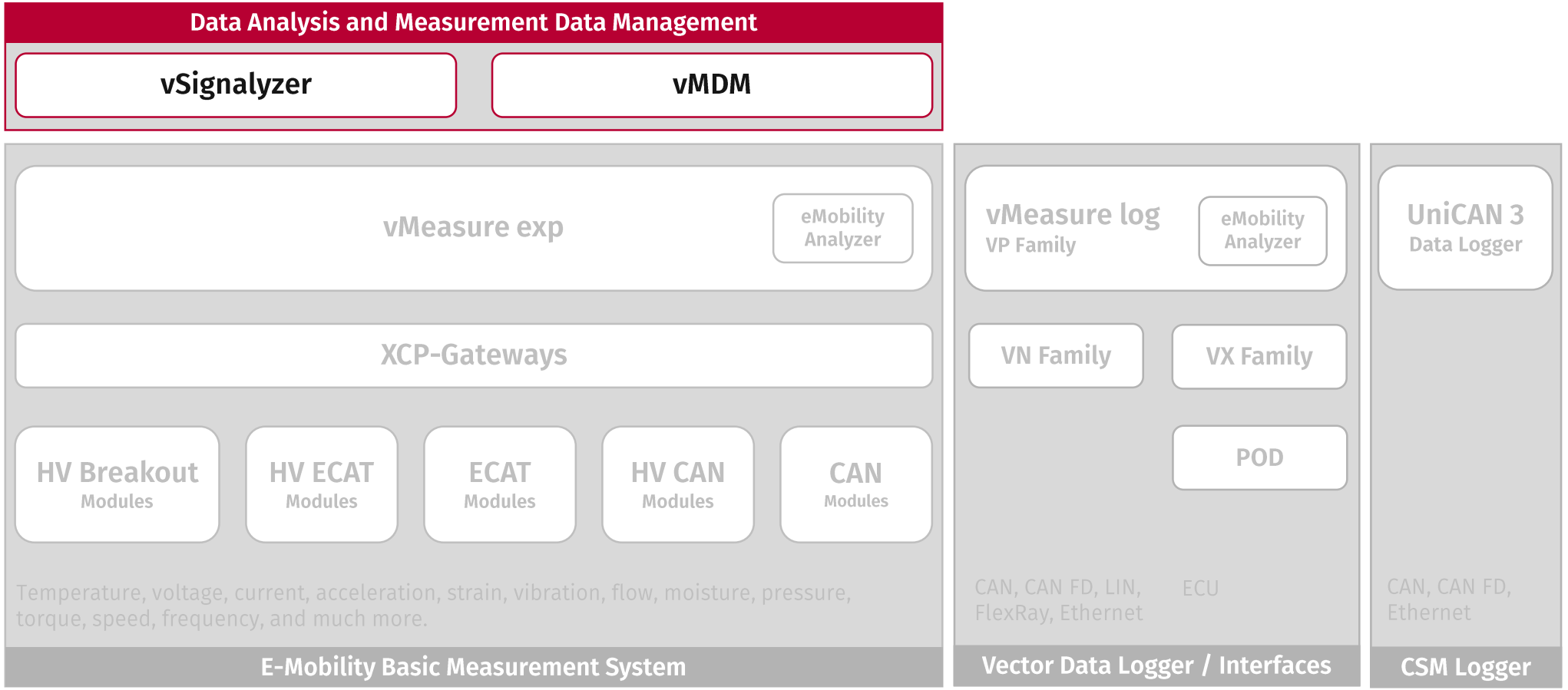
Processing and storage







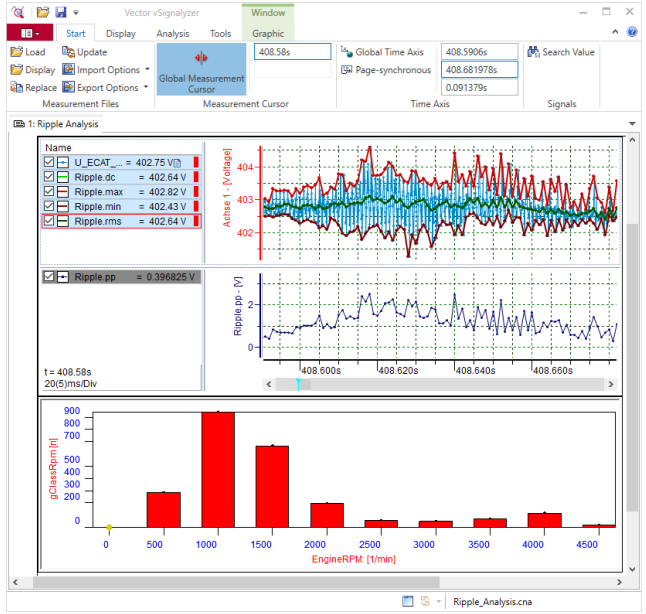
The Vector CSM E-Mobility Measurement System



Data analysis and measurement data management

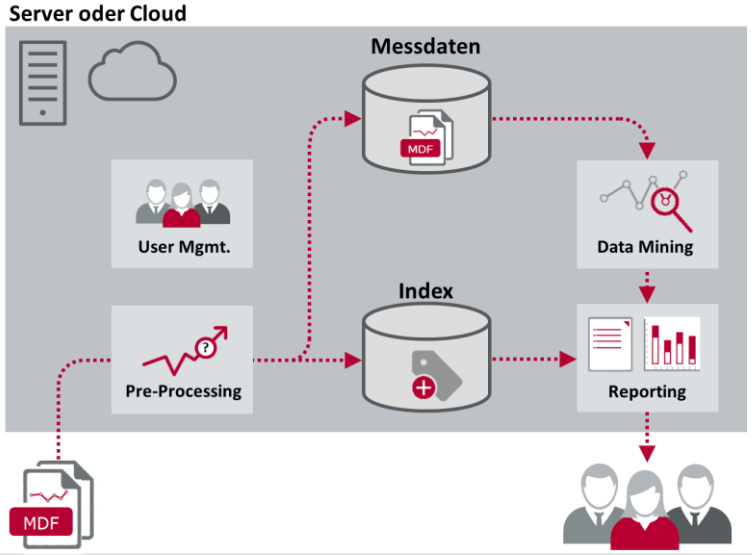
vSignalyzer

- Professional data analysis with data mining
- Optimized for the analysis of multiple, even very large measurement files
- Automated analysis and evaluation

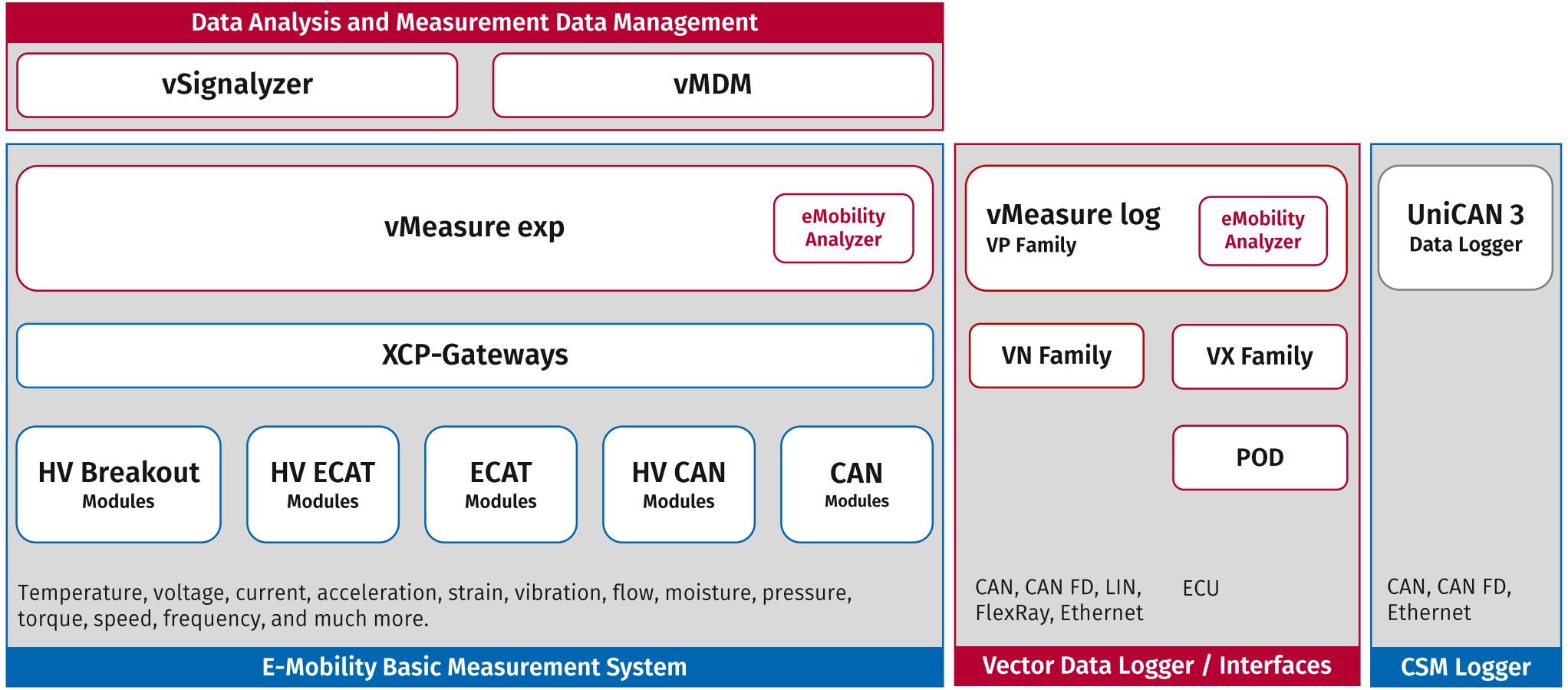


vMDM

- Scalable measurement data management for very large numbers of measurement files from driver tests or test bench runs
- Secure storage on server and cloud
- Secure access, convenient searching and reporting

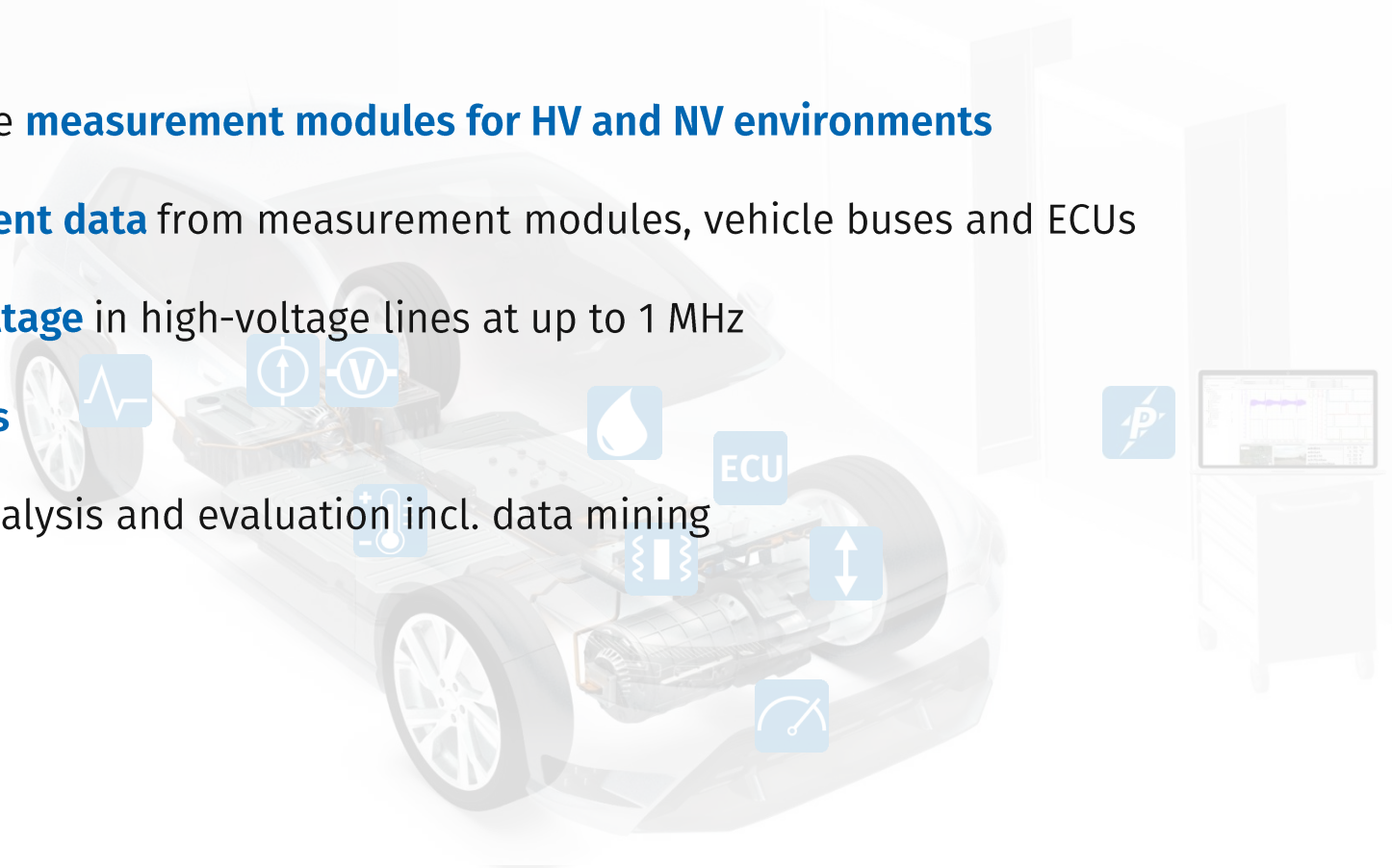


The Vector CSM E-Mobility Measurement System

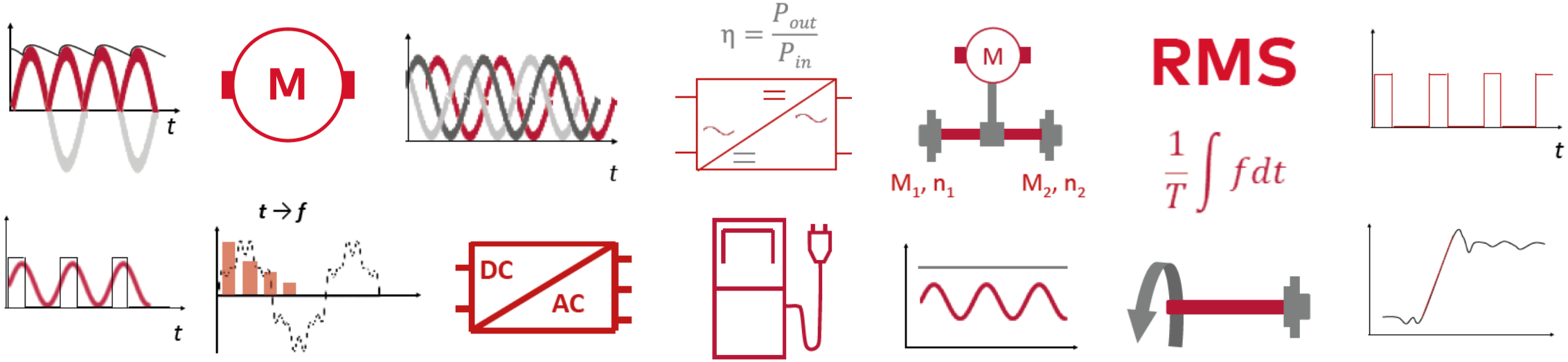


Features and benefits of the Measurement System

- **Decentralized, scalable measurement system** for vehicle and test bench with high-performance e-mobility online analysis
- Extremely compact, robust and fail-safe **measurement modules for HV and NV environments**
- **Synchronous acquisition of measurement data** from measurement modules, vehicle buses and ECUs
- **Direct measurement of current and voltage** in high-voltage lines at up to 1 MHz
- Multi-channel **real-time power analysis**
- **Raw data recording**, powerful signal analysis and evaluation incl. data mining



Features and benefits of the Measurement System



The E-Mobility measurement system is constantly being expanded with customer applications.

You will receive new analysis tools free of charge with each Vector software release.

New measurement modules from CSM open up applications for all areas of electromobility.

About CSM

CSM has been setting technological standards for decentralized measurement technology in vehicle development for over 35 years. Our CAN bus and EtherCAT® measurement devices support worldwide renowned vehicle manufacturers, suppliers and service providers in their developments.

Continuous innovation and long-term satisfied customers are our guarantee for success. Together with our partner Vector Informatik, we have developed an easily scalable and powerful E-Mobility Measurement System for hybrid and electric vehicles and are constantly expanding the areas of application. With our high-voltage safe measurement systems designed for fast and synchronous measurements and power analyses, we actively accompany the change to E-Mobility.

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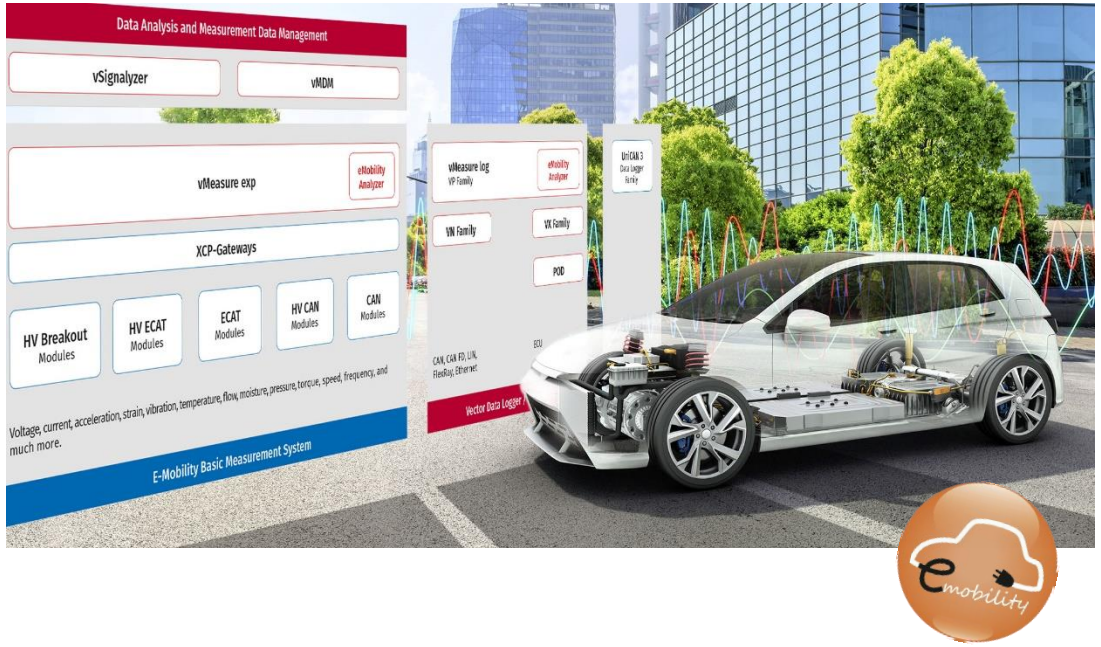

For more information and the current dates of CSM Xplained, please visit

www.csm.de/webseminars

CSM Xplained
measurement technology