

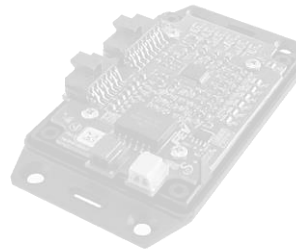
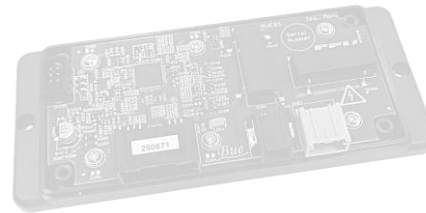
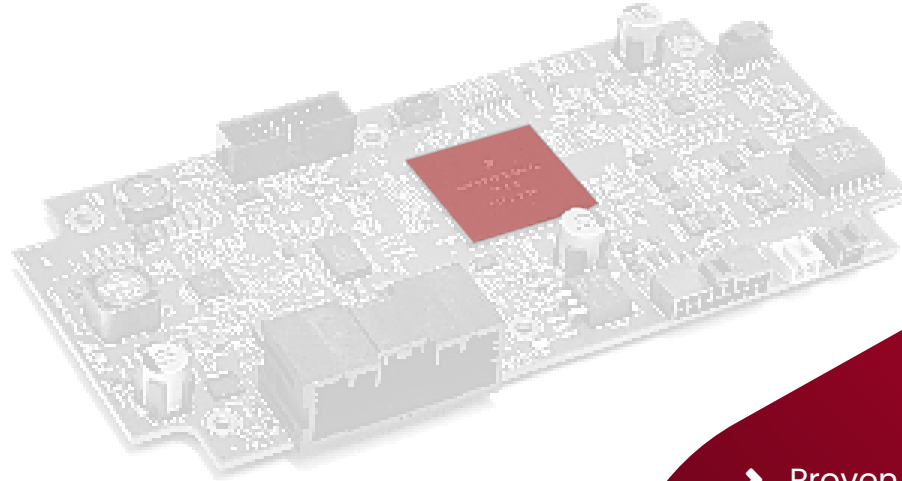
Battery management systems

FEV SIGNATURE SOLUTIONS

Our solutions enable new players (e.g., Start-ups, Tier x, OEMs) to quickly enter the xEV market

FEV offers

- ▶ BMS hardware and software solutions
- ▶ BMS solution for automotive and industrial applications
 - ▶ Different chemistries (NMC, LFP, LTO, SIB, etc.)
 - ▶ From 12V up to 1000V
 - ▶ A-SPIICE and ISO26262 certified
 - ▶ AUTOSAR and AUTOSAR-free variants
- ▶ Customization services for prototypes or series applications
- ▶ Additional services as modification/extension, integration, commissioning and calibration

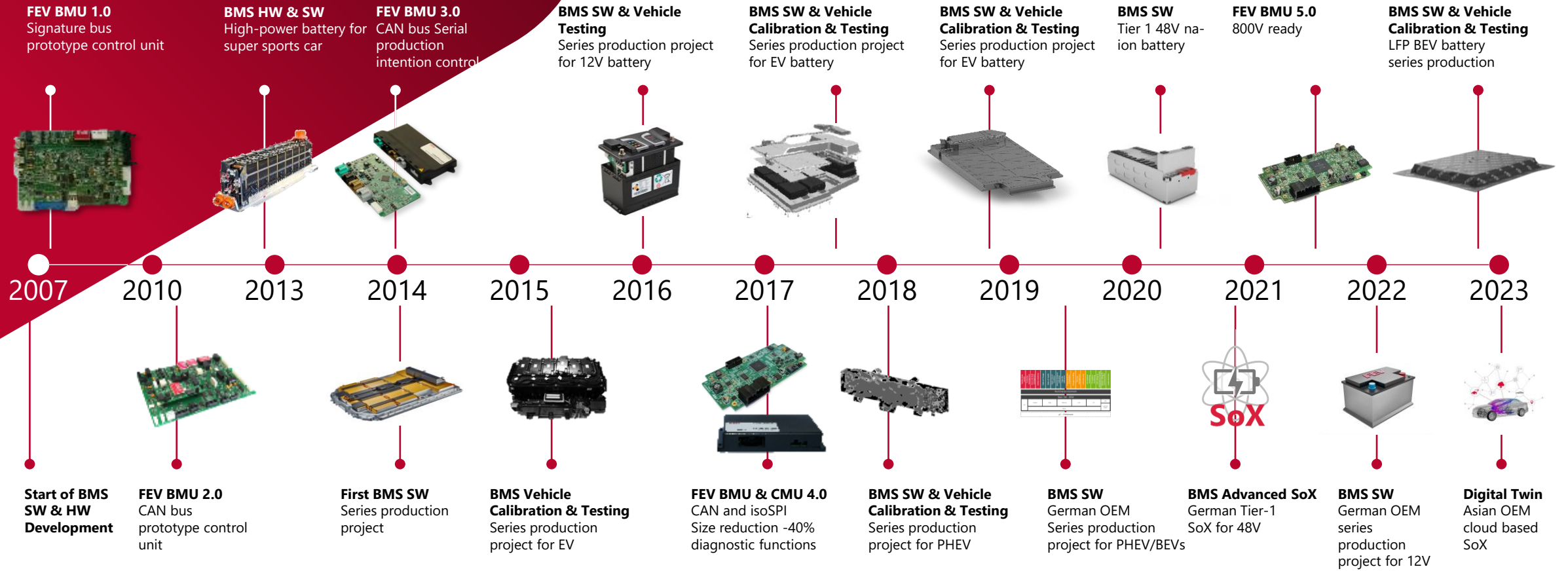


Why FEV

- ▶ Proven solutions applied to various applications and continuously optimized since 2007
- ▶ White box option to enable customer to use FEV's solution as basis for its own development
- ▶ Customization by FEV to exactly address customers' needs
- ▶ Customer friendly license model, as one time license fee and tailored license scope

Reference projects

FEV'S BMS

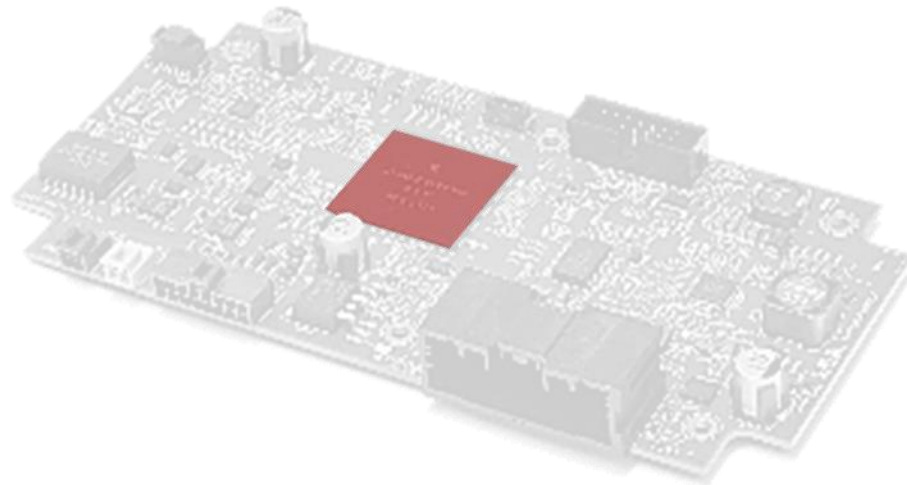


FEV's BMS application software

Developed, defined, approved in FEV's software landscape



SERIES BMS SOFTWARE AS PART OF FEV'S BATTERY PORTFOLIO



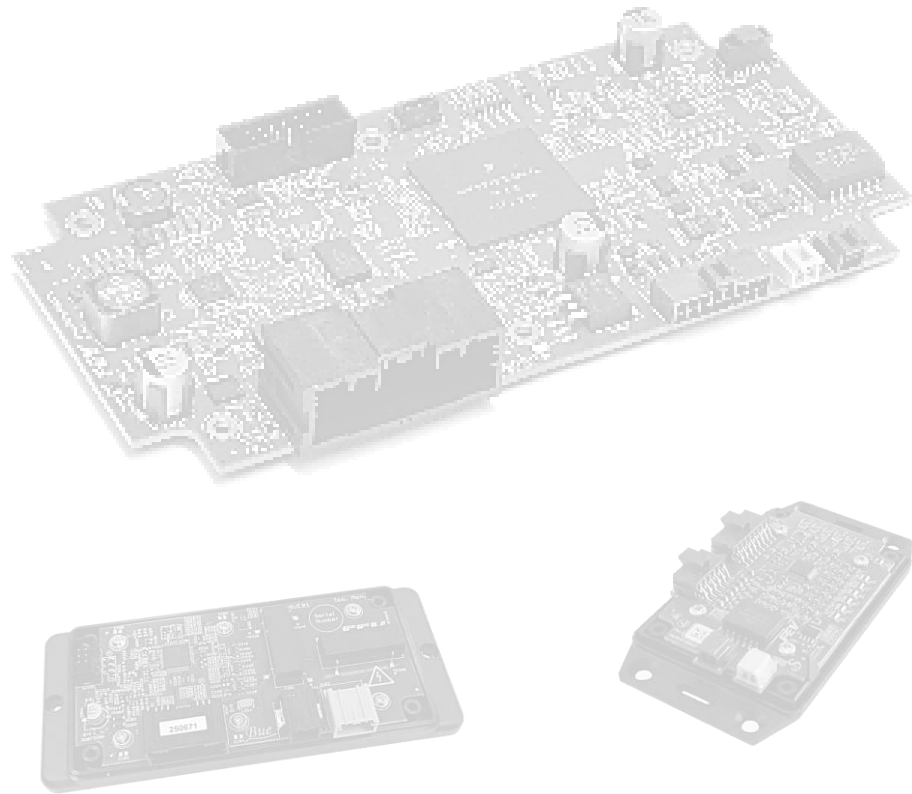
| | |
|--|---|
| Battery system control | System state machine, contactor management, balancing, thermal management, charge handling. |
| Advanced battery state estimation | State of charge, state of energy, state of power, state of operation, state of health. |
| Battery system monitor | System current monitor, system voltage monitor, cell voltage monitor, cell temperature monitor, isolation monitor, interlock monitor. |
| Diagnostics | Monitor system health and detect potential faults. Coordinate system response for maximum system availability and reliability. |

FEV's BMS hardware

Developed to enable customer specific development



PROTOTYPE BMS HARDWARE AS PART OF FEV'S BATTERY PORTFOLIO



Battery management unit

Designed for **48V to 800V systems**; it operates with single- and **multistring-layouts** and **switchable 400V/800V** batteries; **various configurable I/O** (analog, digital, PWM, etc.).

Cell monitoring unit

12 cell voltage channels per unit; high power **passive cell balancing**; **6 cell temperature channels** per unit.

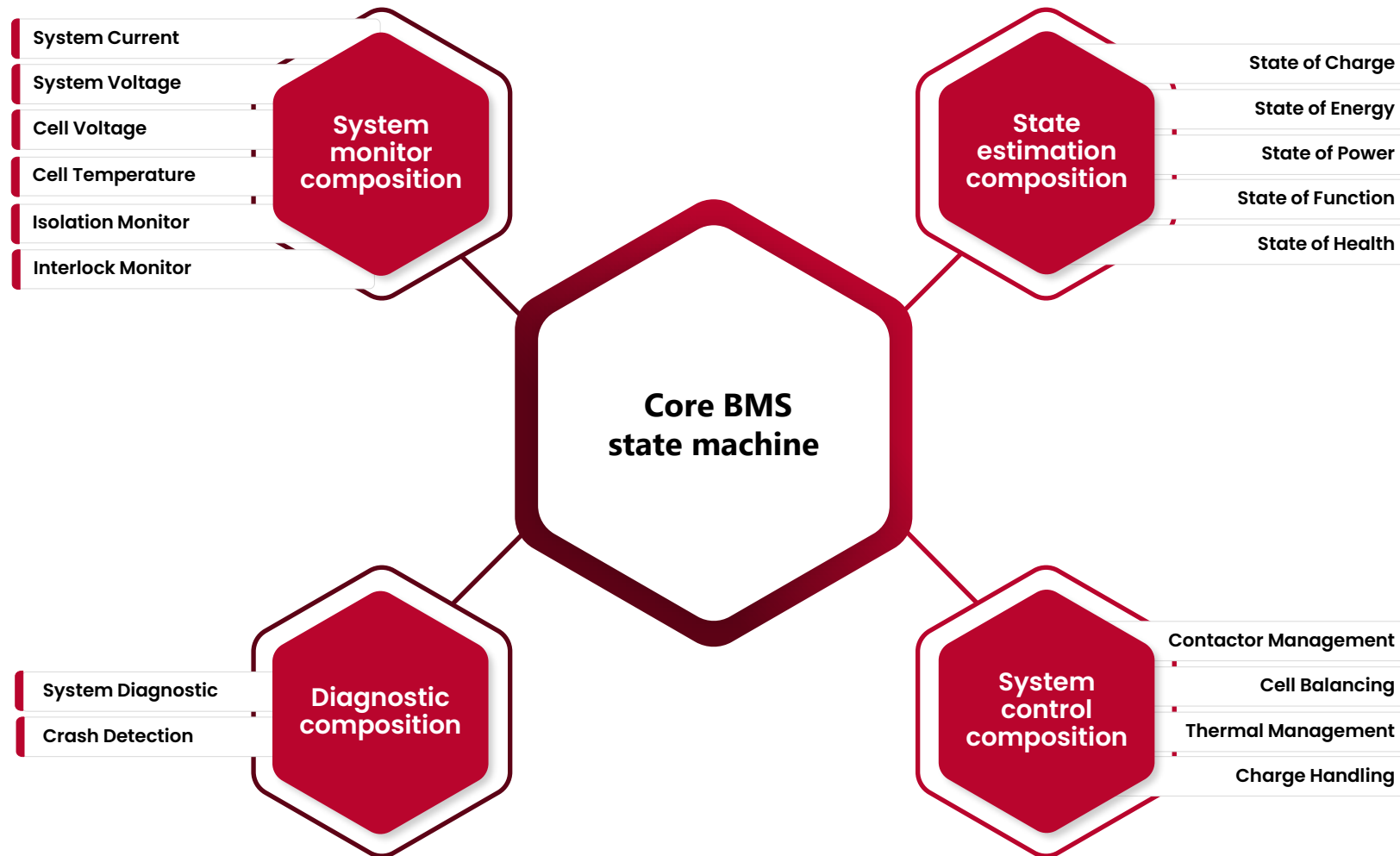
Isolation monitoring unit

Passive isolation measurement of systems with voltages of **up to 800 VDC**; Independent "GND sense" connection for **self-test functionality**.

FEV's BMS application software SW architecture for BMS



SERIES BMS SOFTWARE – FUNCTIONS OVERVIEW



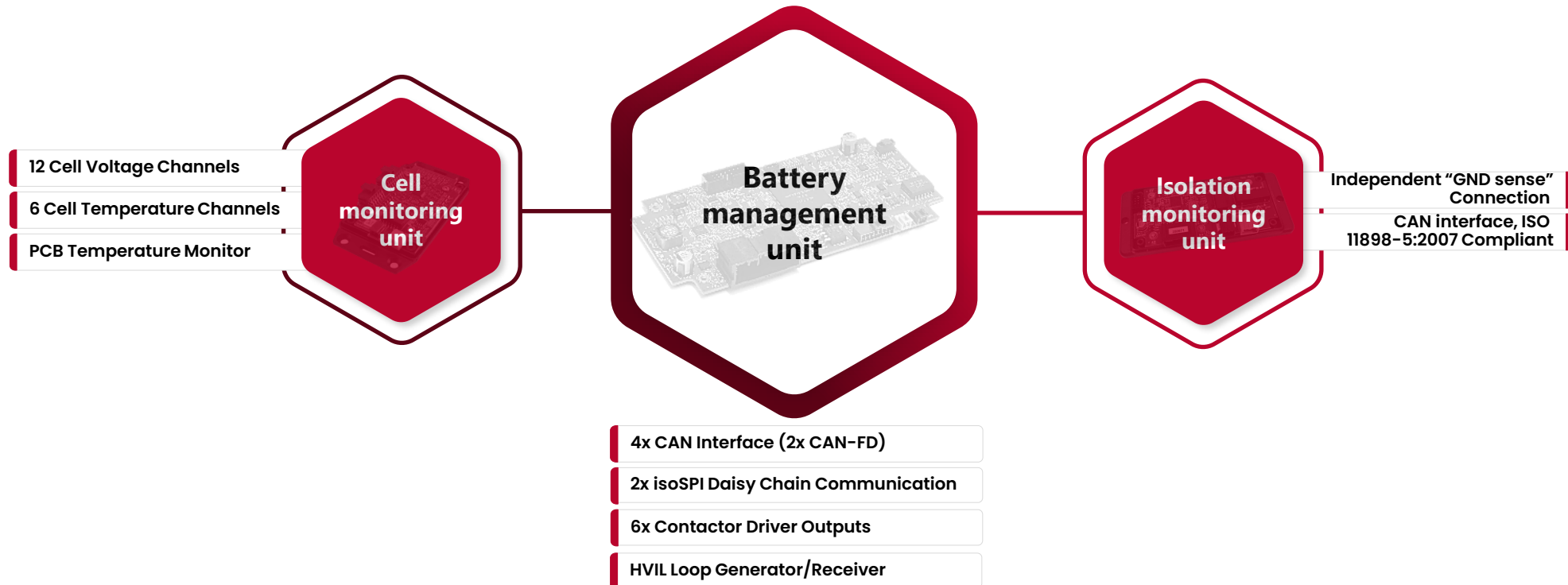
FEV's BMS hardware

A rapid prototyping solution



PROTOTYPE BMS HARDWARE – INTERFACES OVERVIEW

- › Interface for up to **20** CMUs
- › Up to **360** cell voltage measurements



Get in touch with us for further information



[www.fev.com/en/
signature-solutions](http://www.fev.com/en/signature-solutions)