BMS

INDUSTRIAL

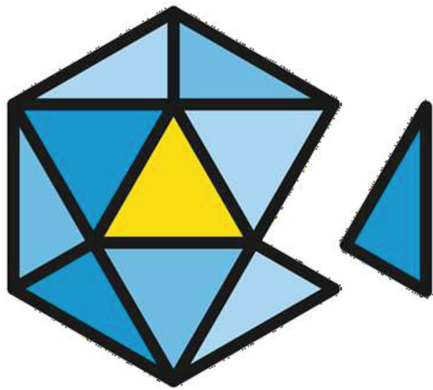## SAFETY & ENTRY

Project Analysis
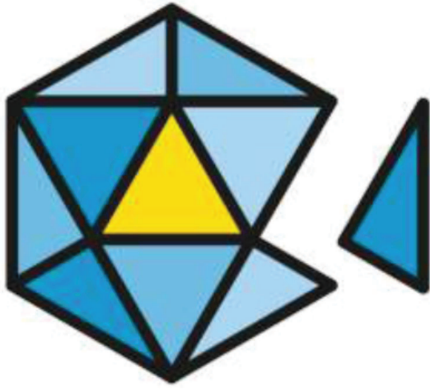
Spin Foam

Safe, Flexible and Economical
BMS.

PROJECT ANALYSIS

Starting from what are the current and (we hypothesize) future market demands, we propose the development of two types of products:

1 - BMS INDUSTRIAL SAFETY

The evolution of regulations for industrial applications will soon make it mandatory to adopt more stringent safety levels (safety – SIL and ASIL).

Therefore, starting from ST products, including L9963E (14 channel monitoring and balancing IC) and L9963T (Isolated Transceiver) , already certified in terms of safety, it is undoubtedly strategic at an economic and technological level to anticipate market trends and satisfy already current requests with superior products in terms of safety (For example using ST MCU with dual core and lockstep system) .

2 -BMS INDUSTRIAL ENTRY

Always keeping an eye on costs, we also consider it necessary to develop a BMS capable of satisfying what are currently all customer requests, at the lowest possible cost, thus providing a valid global solution for any type of product that uses lithium batteries.
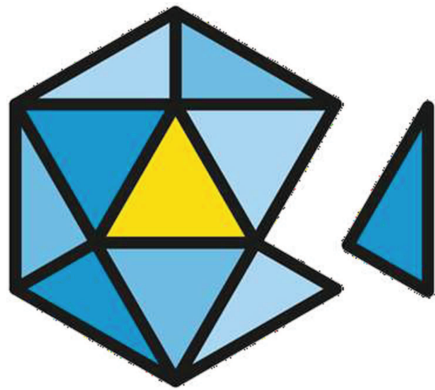
ARCHITECTURE

Both projects have a MASTER + SLAVE type architecture.

MASTER'S DEGREE

The proposed architecture covers, with a single-board system (i.e. with only the use of the master), the complete needs for applications up to 48V nominal (<60V dc), i.e. the majority of vehicles and instruments with power up to 15kW. The basic board therefore allows you to control up to 14 cells with isolated AFE.

Low voltage systems.

The single basic board therefore provides for being able to be powered directly by the battery voltage from 12V up to 60V with a self-holding system in order to have the possibility of activation by means of a button, this to allow the bms (without adding dc / dc and relays external) the total deactivation of the load in alarm conditions (total voltage or single cell too low) or prolonged inactivity.

SLAVE

For the addition of further cells in series, the use of additional slave cards to be connected to the master is envisaged. Each slave provides for an increase in the maximum number of cells by 14 units.

High voltage systems.
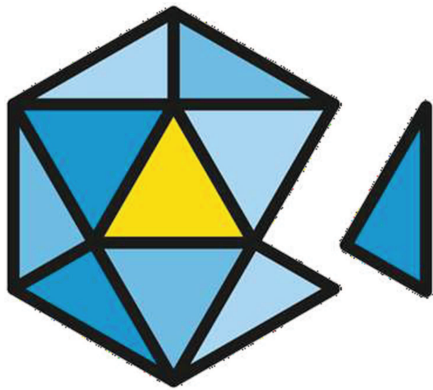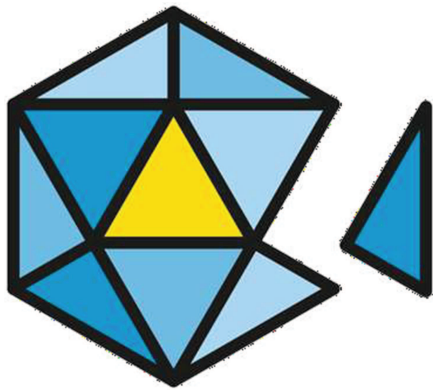
ARCHITECTURE

LINES OF COMMUNICATION

The presence of three CAN / FT communication lines will allow you to have:

• dedicated line for external battery charger interface.
• line dedicated to optional expansion for active equalization and / or for adding temperature sensors, lacking in standard AFEs, especially for systems that use several cells in parallel.
• dedicated line for connection to vehicle hardware (dashboard, servodrivers…).

IINPUT / OUTPUT

In addition to all the necessary communication systems, the system will consist of:

• Optional isolated analog inputs for battery stack voltage measurement.
• Up to 4 outputs for remote control or external relay control.
• Up to 4 inputs for status and enabling control.
• Optional isolated output for battery charger control with PWM.

ARCHITECTURE

FUNCTIONALITY'
The basic board will allow you to connect up to 3 current measurements, one with shunt and 2 additional ones with hall sensor (for greater resolution if the hall sensor is used it will be "double", or with double sensitivity in order to be able to perform precise even with very low currents) and consequently have an excellent current measurement accuracy, useful in the implementation of all cell monitoring techniques (Coulomb counter, SoC, SoH...).
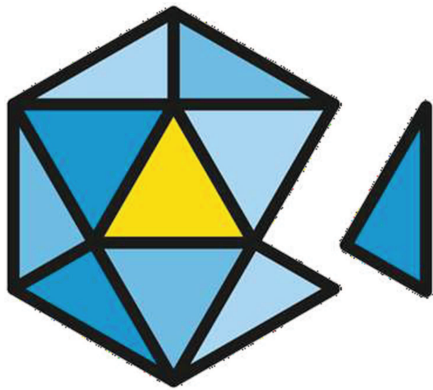
Pit will also possess:

> • Real time clock with battery to allow recording of events and alarms.
> • Sd card to record historical and alarms.
> • EEprom memory for setting parameters.
> • Debug provided with Jtag interface connection (no USB on board).
> • Serial line option (SPI / Uart) for wi-fi or bluetooth adapter connection.
> • Daisy chain from AFE to further slaves, option for ring closure to MCU (SPI).
> • Ultrafit Molex high reliability industrial connectors for cables up to 1.5mm2.

EXPANSIONS
An expansion will also be developed, fully controllable by the MASTER, used to perform the active equalization of the cells.