

Electromechanical Brakes and UNECE R13/R13-H

Workshop in Brussels – March 29th/30th

Electromechanical Brakes (EMB)

Purpose and Scope

- Electric transmission:
 - Current regulation for the service braking only addresses electric control transmission
 - The **purpose** of the EMB amendment is to address also electric energy transmission in the regulation
- In a first step for UNECE-R13, the **scope** is limited to EMB on the motor vehicle; the trailer remains as today

Main challenges

- Keep same safety level as with current technologies
- Account for new technology, while avoiding design restrictions
- Keep the requirements performance-/function oriented
- Avoid unwanted side-effects on existing regulation
- **Keep R13 and R13-H definitions and principles aligned**
- Example technical challenge:
 - Effect of ageing and temperature on the performance of energy storage devices
- Example regulatory challenge:
 - Ensure energy warnings are displayed to the driver acc. to performance level

Proposed definitions

"Energy source" means a device which receives energy and converts it into the required form (i.e. medium). An energy storage device is not considered as a source.

e.g. compressor, pump, alternator...

But not the traction battery nor a DC/DC converter

"Energy supply" means all parts, including an energy source, if any, that are necessary to supply energy for the operation of the braking system. The supplied energy can be used to be stored in the energy storage devices and/or can be used directly to feed the control transmission and/or the energy transmission.

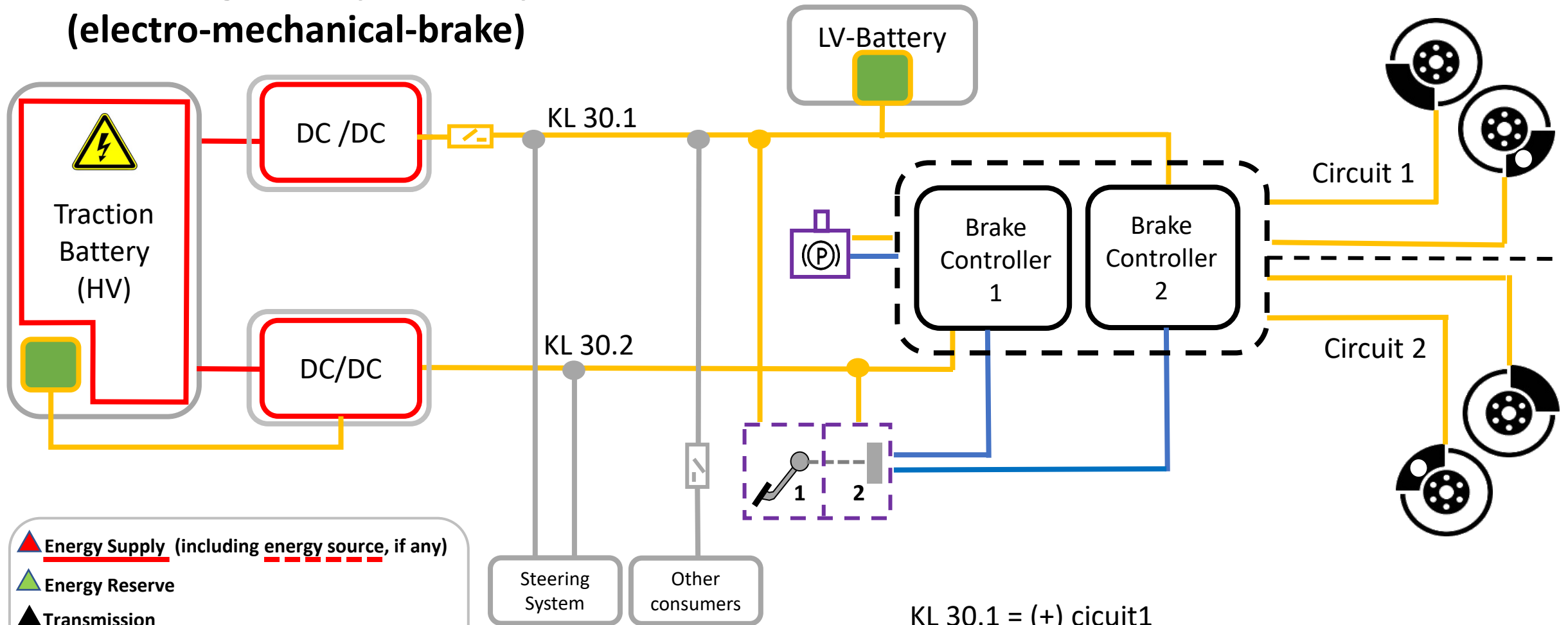
e.g. DC/DC converter

"Energy reserve" means the stored energy needed for the operation of the braking system.

Passenger Car layouts

- electro-mechanical-brake
- electro-hydraulic-brake
- electro-mechanical-brake / electro-hydraulic-brake

R13H Targeted layouts – layout 1a # (electro-mechanical-brake)

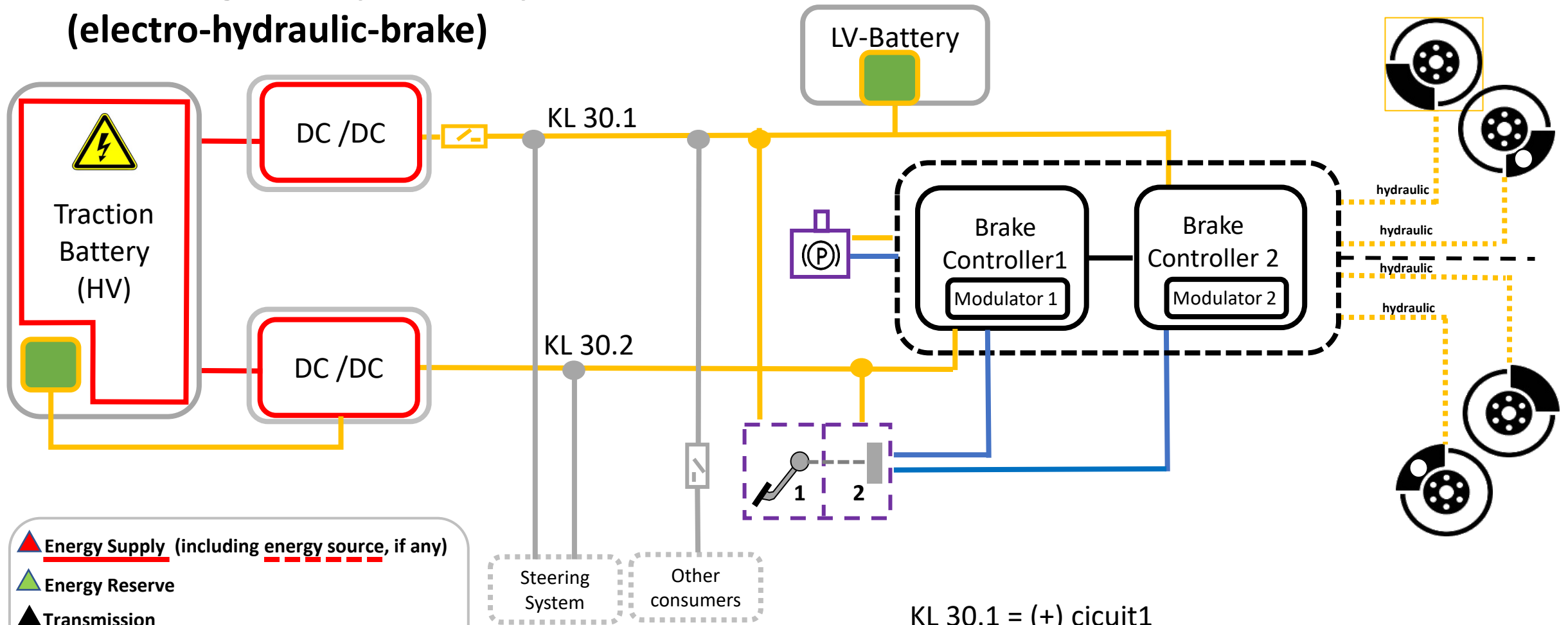


- ▲ **Energy Supply** (including energy source, if any)
- ▲ **Energy Reserve**
- ▲ **Transmission**
- ▲ **Control Transmission**
- ▲ **Energy Transmission** | Electric | Hydraulic
- ▲ **Control**
- ▲ **Not exclusively used by braking system, but total vehicle functions, e.g. Steering**

KL 30.1 = (+) circuit1
 KL 30.2 = (+) circuit2
 There can be [n] circuits (*)

(*) 5.2.8. The action of the service braking system shall be distributed between the wheels of one and the same axle symmetrically in relation to the longitudinal median plane of the vehicle.

R13H Targeted layouts – layout 2a # (electro-hydraulic-brake)



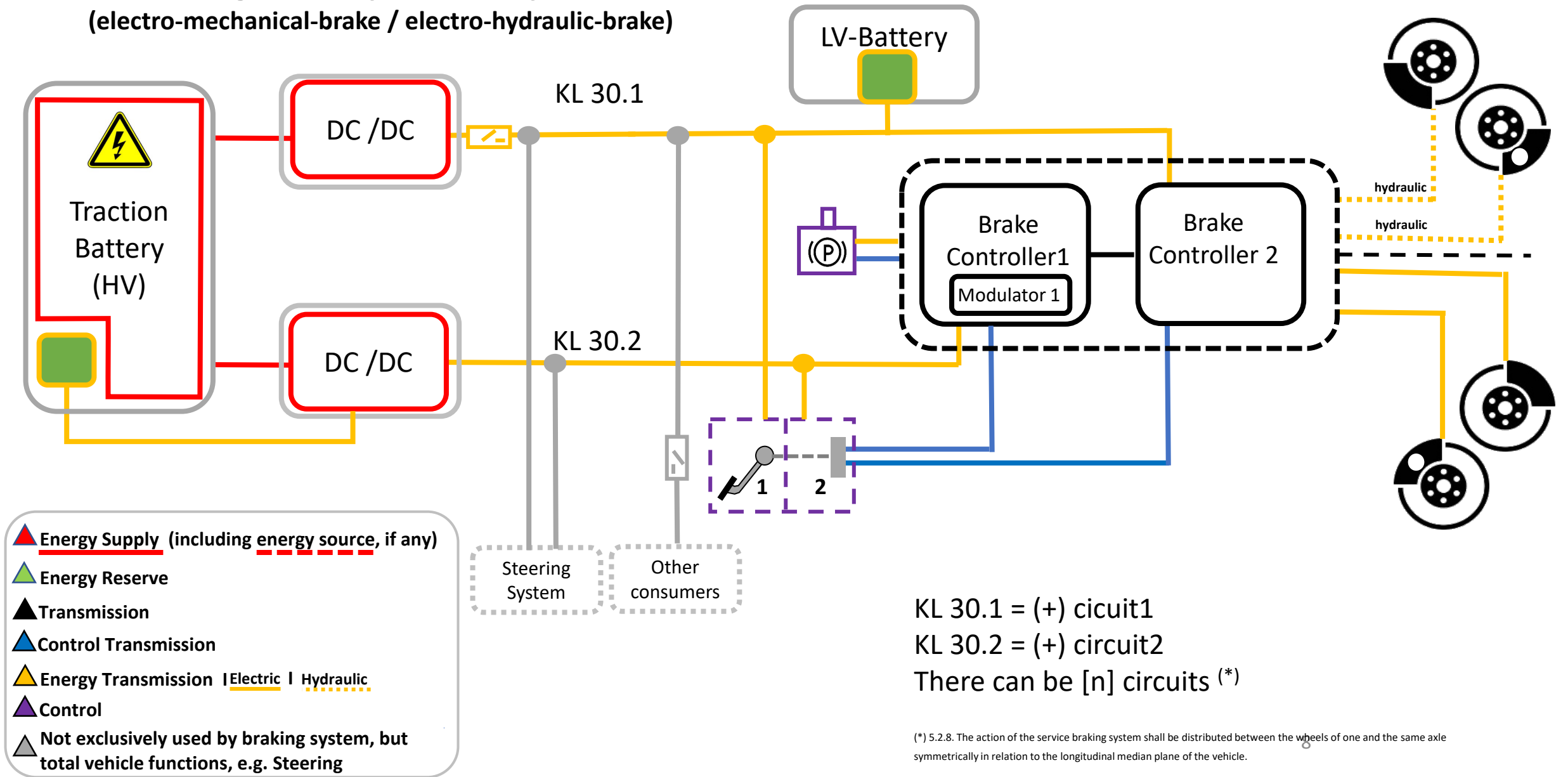
- ▲ **Energy Supply** (including energy source, if any)
- ▲ **Energy Reserve**
- ▲ **Transmission**
- ▲ **Control Transmission**
- ▲ **Energy Transmission** | Electric | Hydraulic
- ▲ **Control**
- ▲ **Not exclusively used by braking system, but total vehicle functions, e.g. Steering**

KL 30.1 = (+) circuit1
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 There can be [n] circuits (*)

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R13H Targeted layouts – layout 3a#

(electro-mechanical-brake / electro-hydraulic-brake)

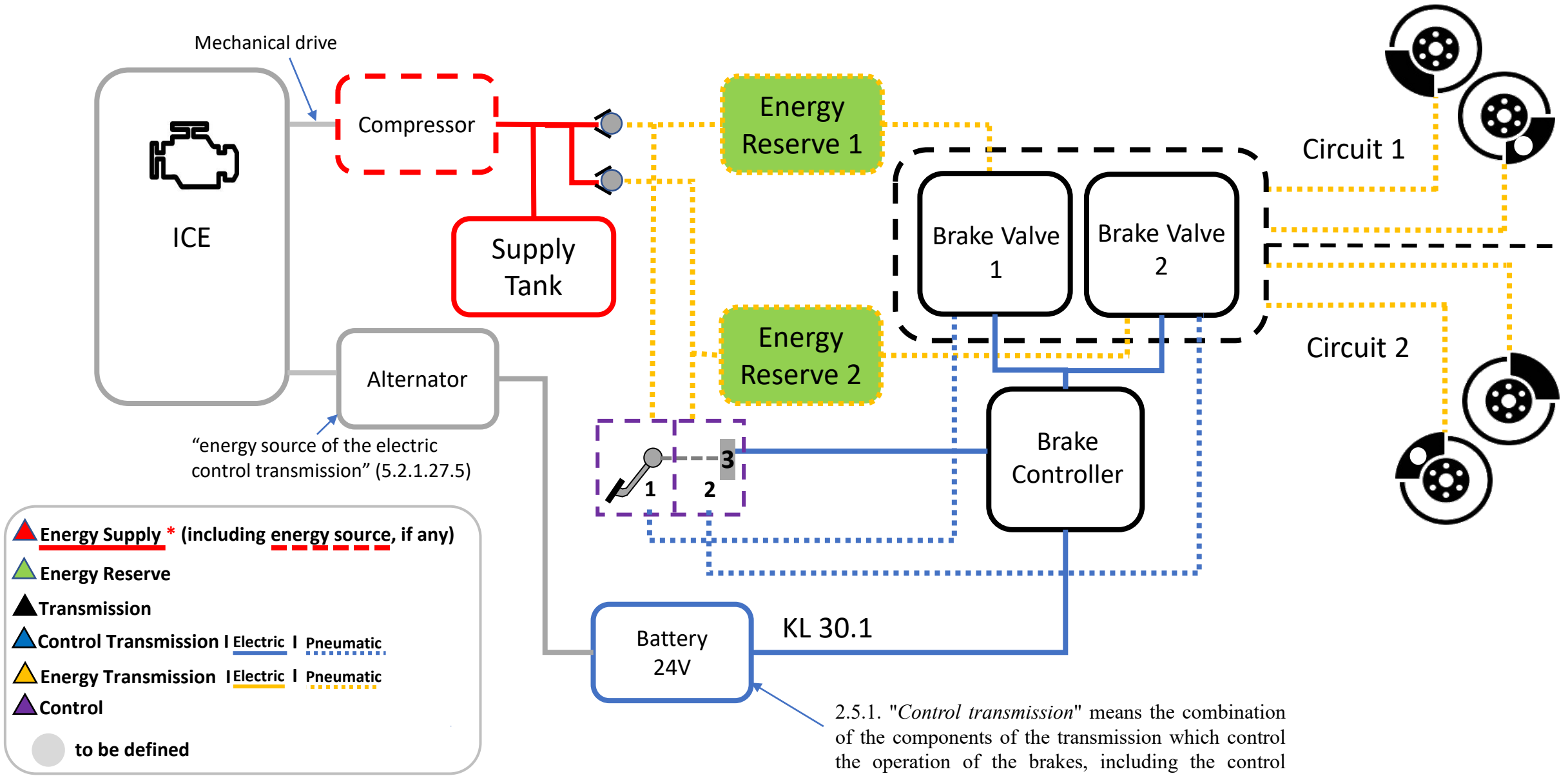


Heavy Commercial Vehicle layouts

- Existing typical layout (EBS)
- Intermediate layout between EBS and EMB
- Targeted EMB principal layouts

Energy transmission = pneumatic
 Control transmission = electric + pneumatic (backup)

R13 - Existing typical layout - EBS



▲ Energy Supply * (including energy source, if any)

▲ Energy Reserve

▲ Transmission

▲ Control Transmission | Electric | Pneumatic

▲ Energy Transmission | Electric | Pneumatic

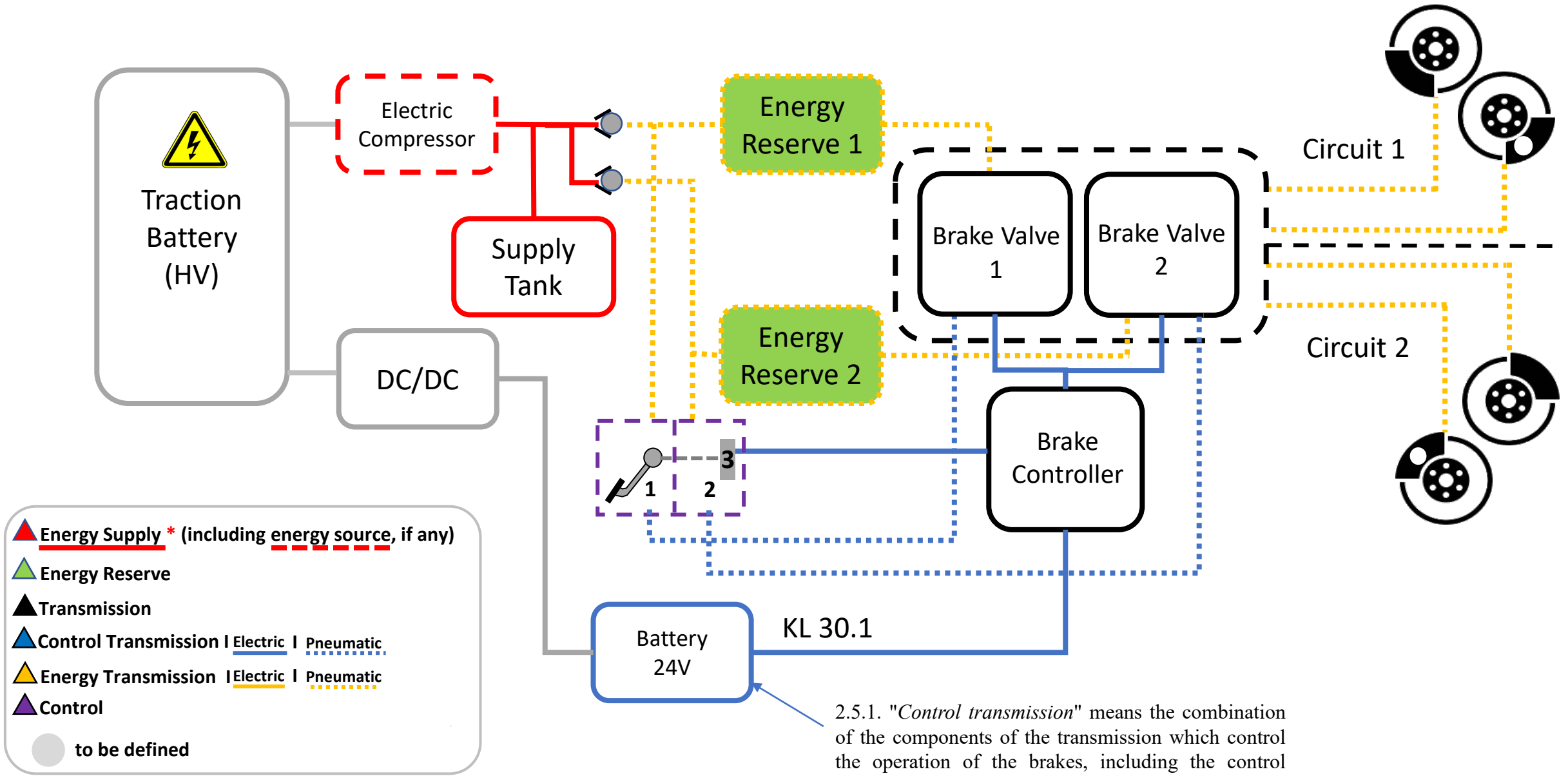
▲ Control

● to be defined

2.5.1. "Control transmission" means the combination of the components of the transmission which control the operation of the brakes, including the control function and **the necessary reserve(s) of energy**.

Energy transmission = pneumatic
 Control transmission = electric + pneumatic (backup)

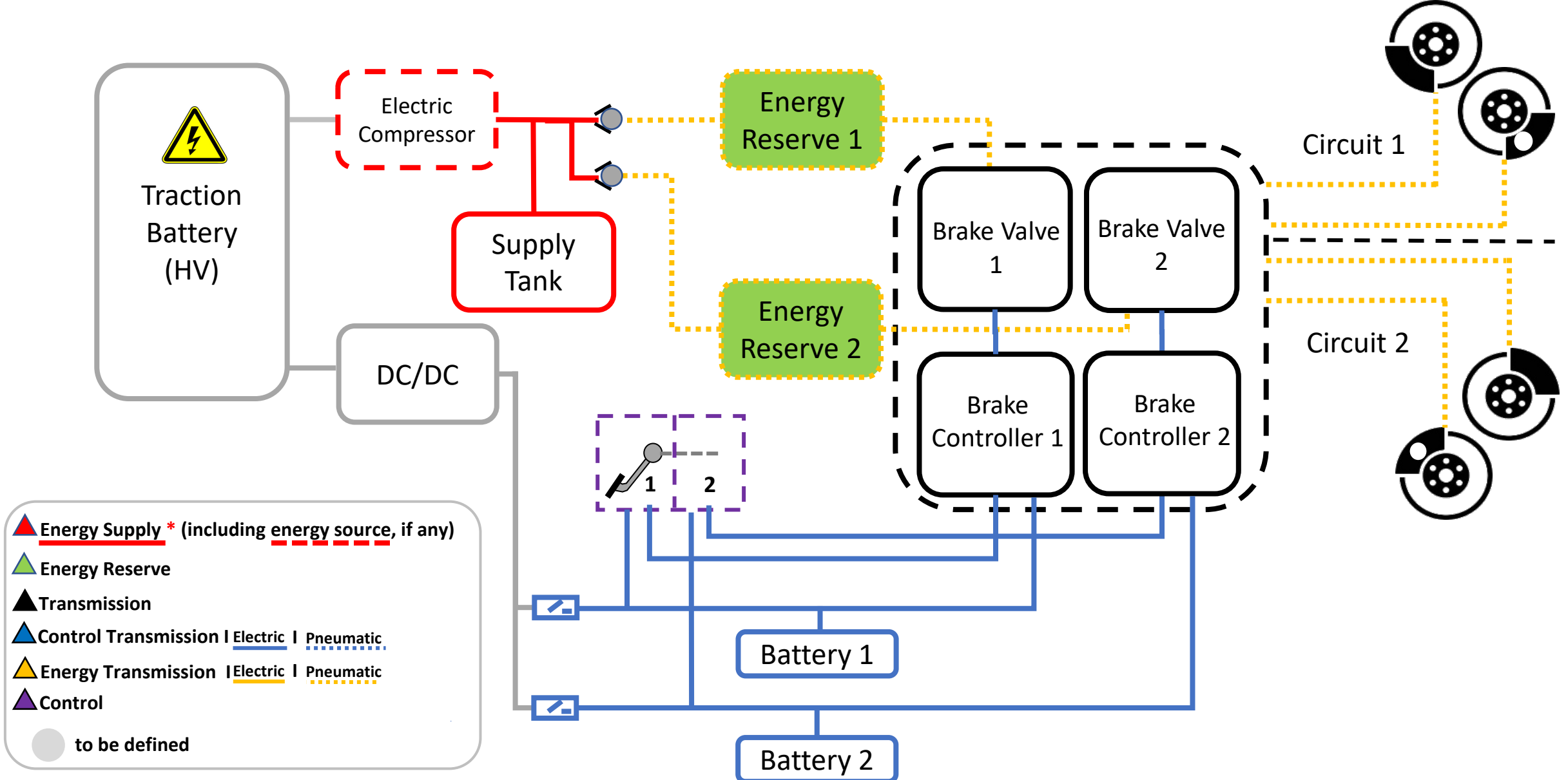
R13 - Existing typical layout - EBS



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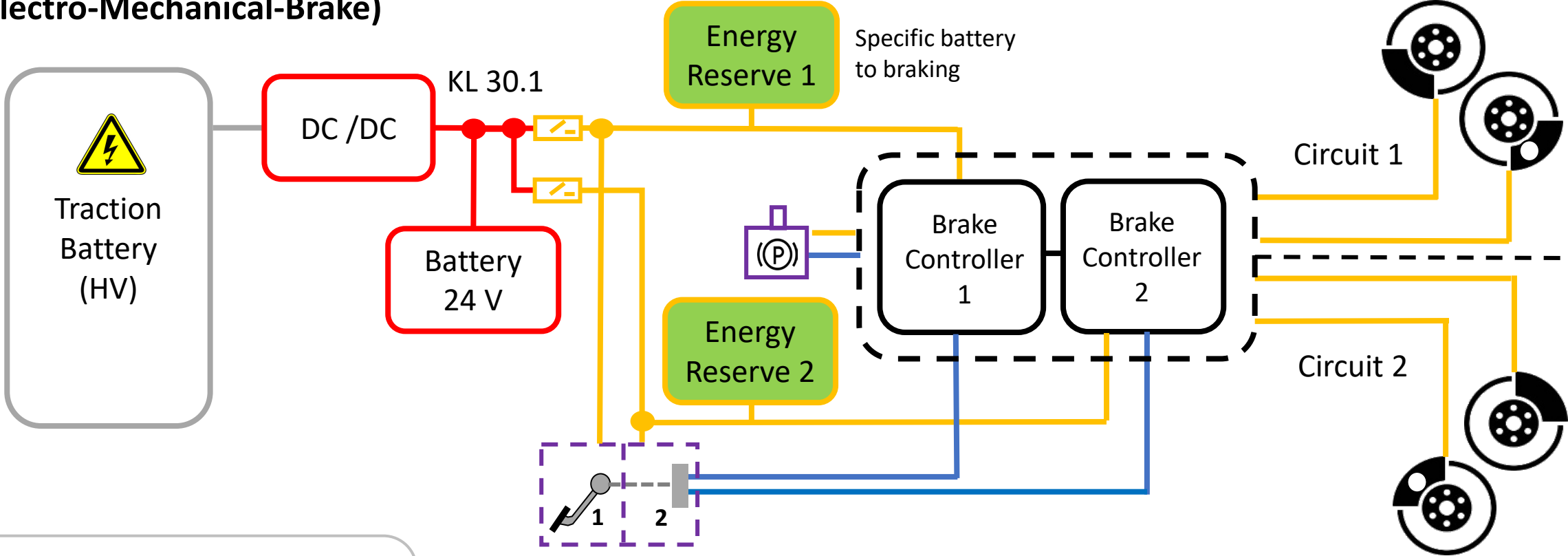
Energy transmission = pneumatic
 Control transmission = electric

R13 - Intermediate step between EBS and EMB



Energy transmission = electric
 Control transmission = electric

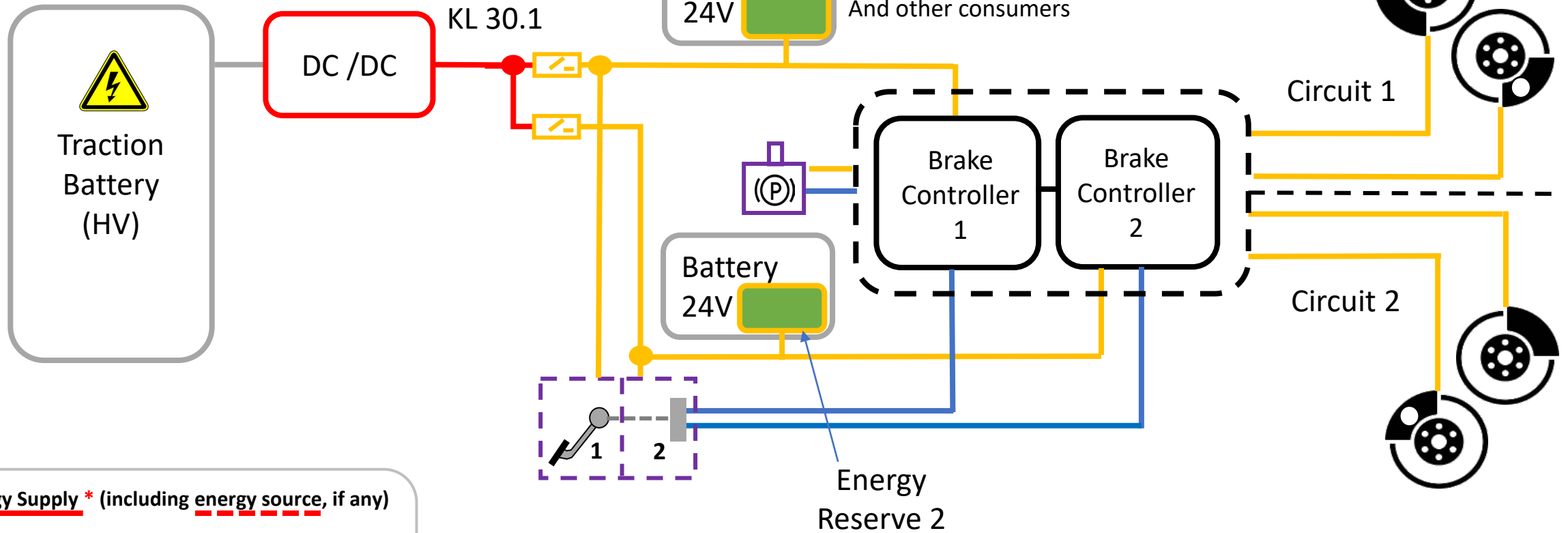
R13 EMB Targeted layouts – layout 1a (Electro-Mechanical-Brake)



- ▲ Energy Supply * (including energy source, if any)
- ▲ Energy Reserve
- ▲ Transmission
- ▲ Control Transmission
- ▲ Energy Transmission | Electric | Hydraulic
- ▲ Control
- to be defined

Energy transmission = electric
Control transmission = electric

R13 EMB Targeted layouts – layout 1b (Electro-Mechanical-Brake)



- ▲ Energy Supply * (including energy source, if any)
- ▲ Energy Reserve
- ▲ Transmission
- ▲ Control Transmission
- ▲ Energy Transmission | Electric | Hydraulic
- ▲ Control
- to be defined