Levelling System

LIEBHERR

System Function

- Hydraulic system for adjusting the access height to the platform height
- System compensates for load-related deflection
- System can also be used to compensate for varying platform heights (platform sensor option)
- Optional compensation of wheel wear with independent hydraulic cylinder chamber
- System is based on the requirements of the ADA (Americans with Disabilities Act)

System Components I

The system consists of the following main components:

- Hydraulic actuators for level control (integrated in the secondary suspension)
- Hydraulic unit for pairwise supply of actuators (one unit per bogie or car)
- Vertical damper with integrated displacement sensor (non-contact measuring principle)
- System Control Unit (SCU) with Ethernet connection to the TCU (train control unit)
- Platform sensor for detecting the real platform height

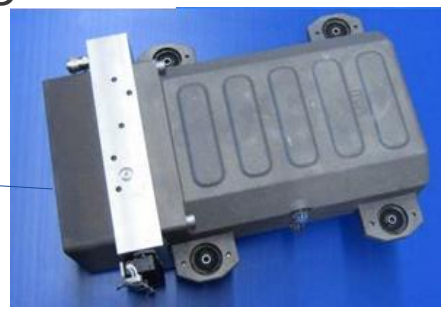
System Components I

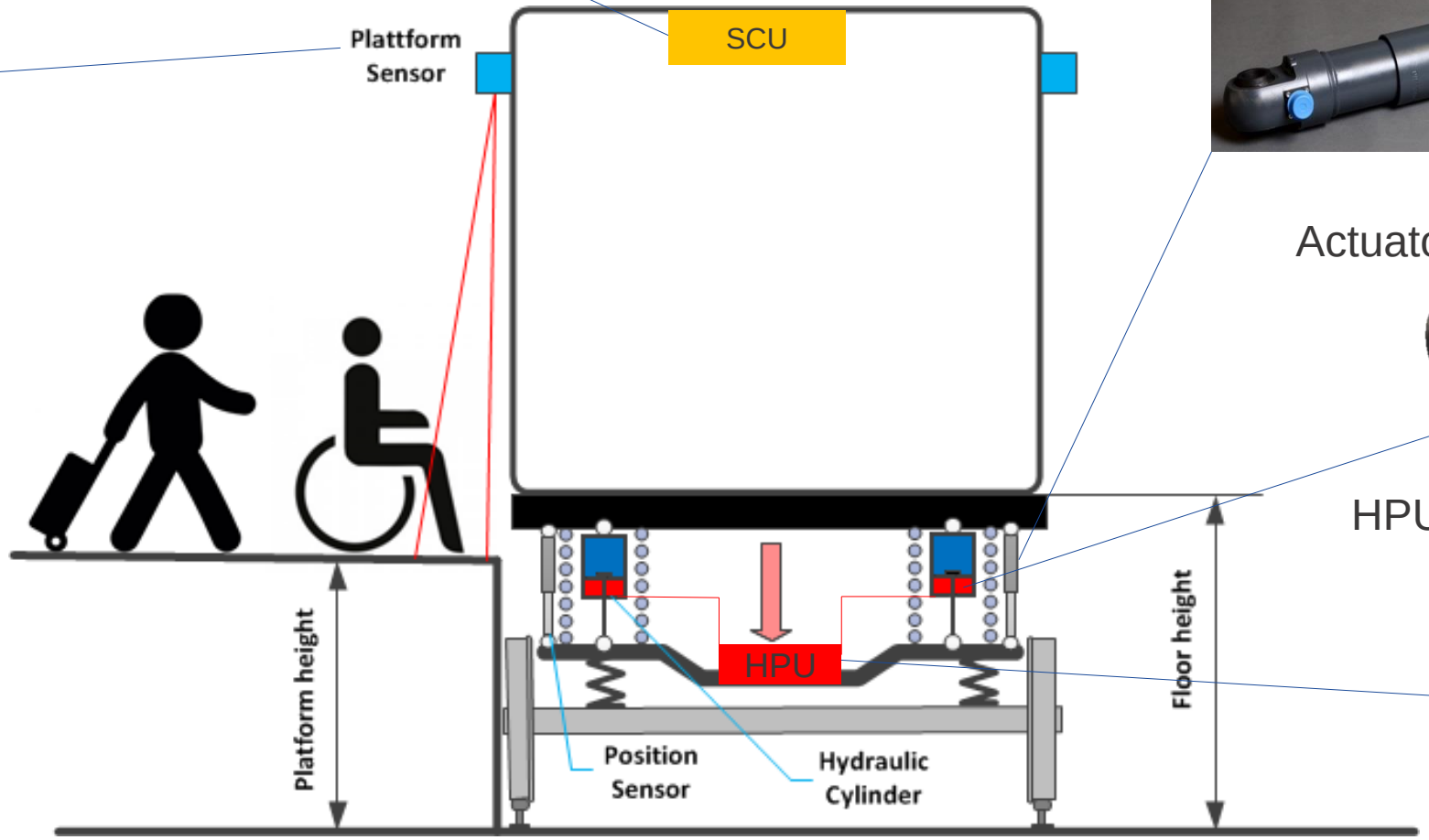
System Control Unit (SCU)

Position Sensor

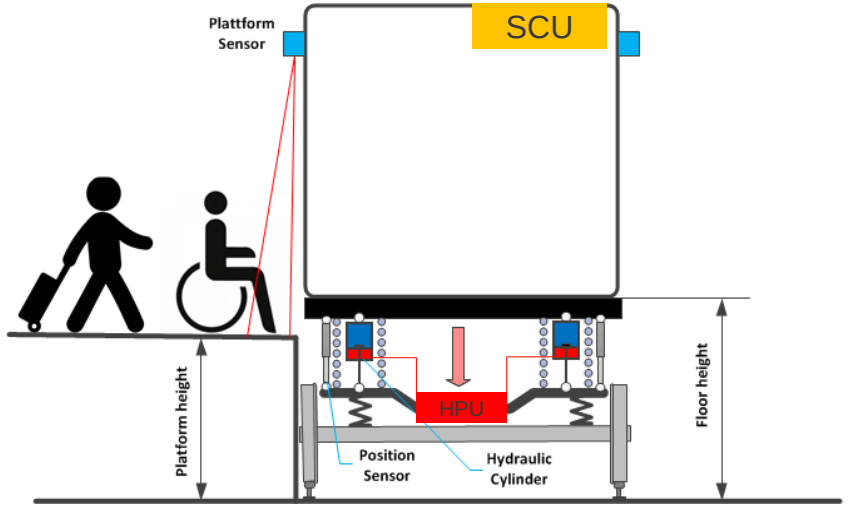
Actuator

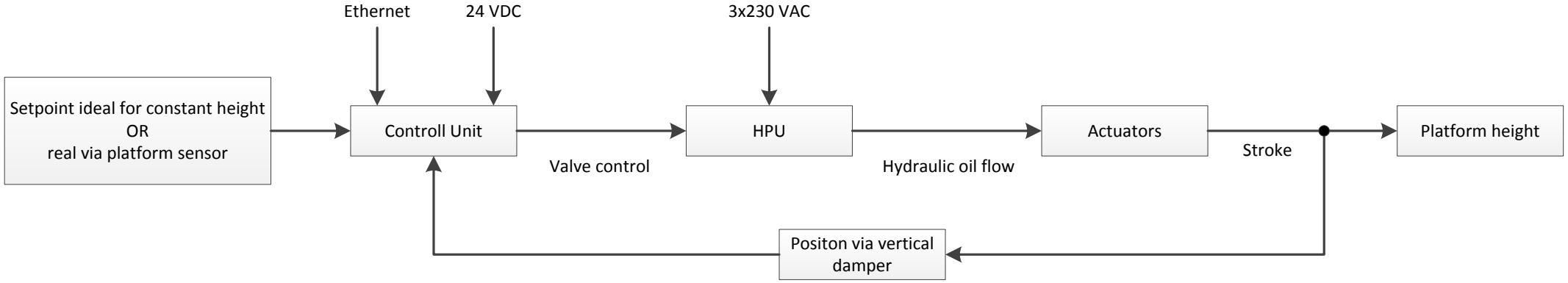
HPU





System Function

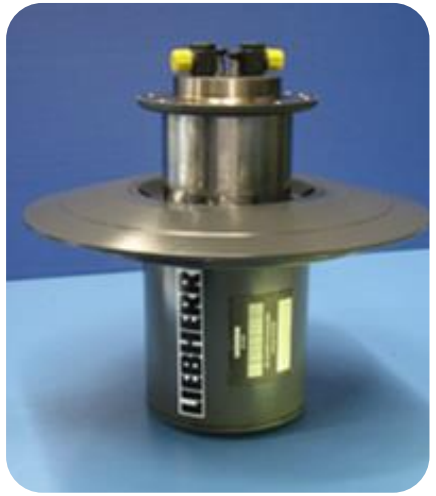


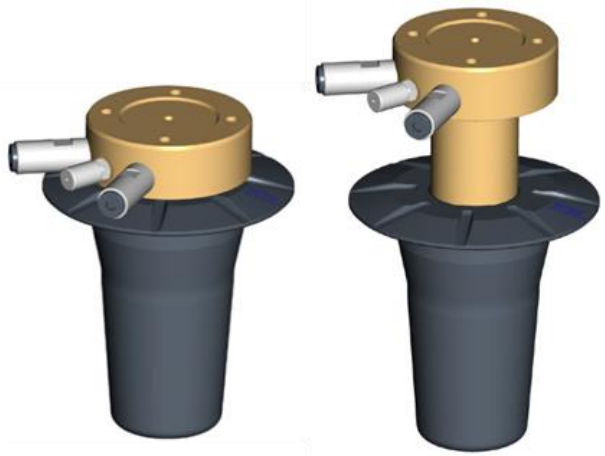


Levelling Actuator

Hydraulic actuators for level control (integrated in the secondary suspension)

- Versatile mechanical integration into the secondary spring stage (coil spring, rubber layer spring) possible
- Lifting force up to 100kN
- Stroke variable

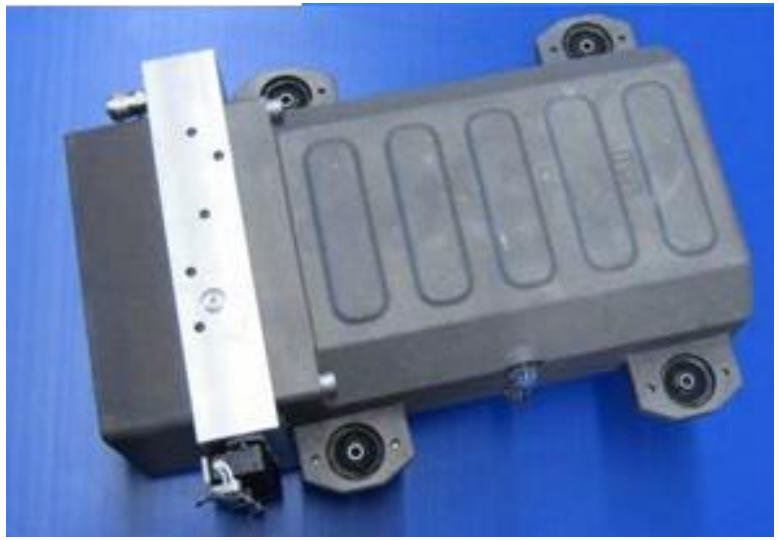




Hydraulic Power Unit

Hydraulic unit for pairwise supply of actuators (one unit per bogie):

- Supplying the actuators with hydraulic fluid
- Pressure sensors for system diagnostics
- Oil reservoir with filter and maintenance elements
- Underfloor mounting on vibration dampers
- Bleeding of the HPU in the "closed loop" via software function and vent connections of the actuators possible
- Hydraulic quick couplings
- Robust and low-noise design (<70dB)
- Drive via three-phase AC motor
- Power consumption approx. ~1kW



Vertical Damper with position sensor

Vertical damper with integrated displacement sensor (non-contact measuring principle)

- Damper with 2 functions:
  - Vertical damper for the secondary suspension
  - Measurement of the damper position and feedback to the electronic control unit
- Magnetostrictive (non-contact) measuring principle
- Stroke and damper characteristic (symmetrical or asymmetric) definable over wide ranges
- Damper can optionally also be specified as lift-off device for the bogie

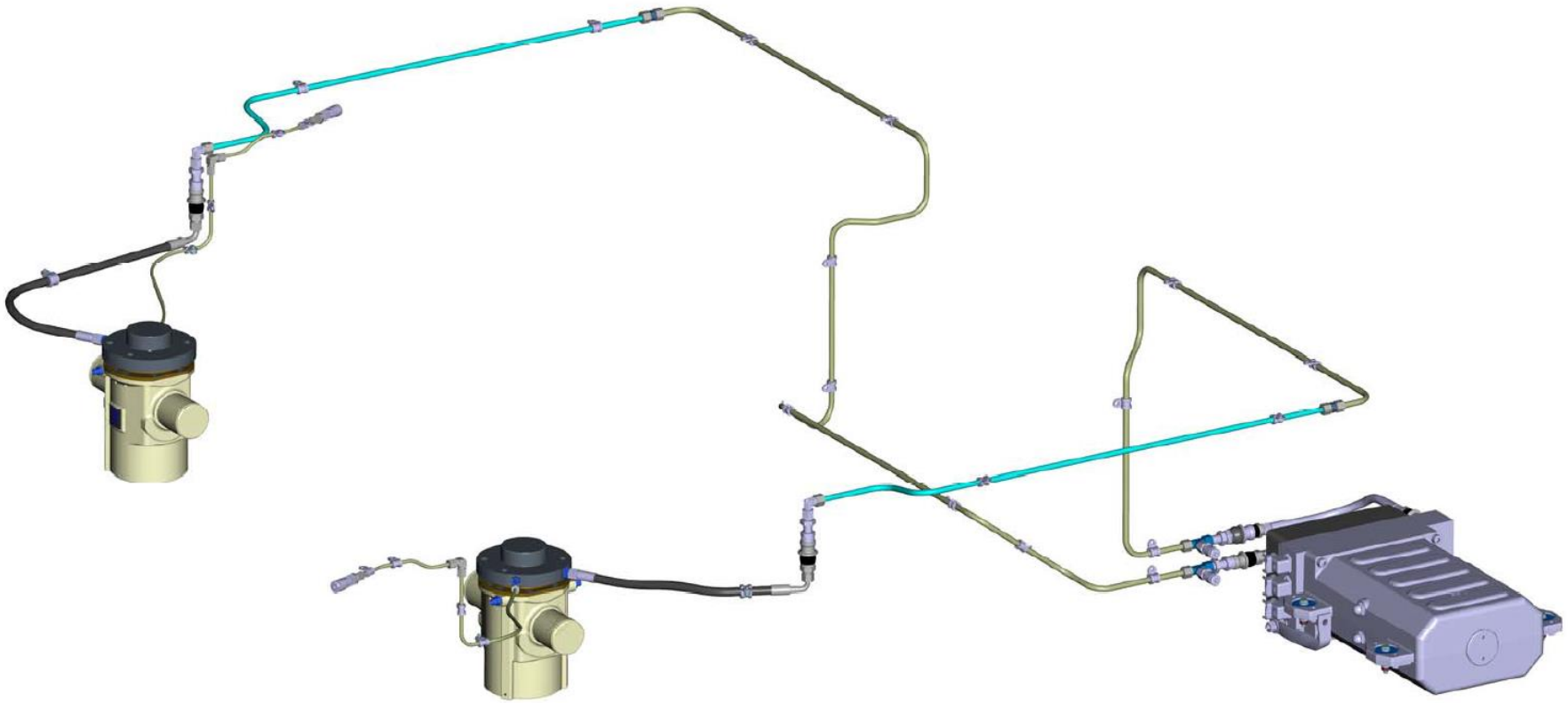
System Control Unit (SCU)

Electronic control unit with Ethernet connection to the central vehicle control

- Modular design with master module (including Ethernet connection) and extension modules
- Railway-conform design according to EN 50155
- Web-based interface for maintenance and diagnostics
- Implementation of different operating modes and diagnostic functions according to customer-specific requirements by Electronic- and Software competence at Liebherr

Hydraulic Piping

Exemplary piping on the bogie - is in the scope of the car manufacturer



Leveling System

Chicago Transit Authority (CTA)

Bombardier

5000-Series

Quantity of vehicles: 714

Equipment quantities: 714

Metrolinx (Toronto)

Bombardier

Flexity Freedom

Quantity of vehicles: 182

Equipment quantities: 182

ION Rapid Transit, (Waterloo)

Bombardier

Flexity Freedom

Quantity of vehicles: 14

Equipment quantities: 14

Chicago Transit Authority (CTA)

CRRC

7000-Series

Quantity of vehicles: 400 + 446

Equipment quantities: 400

Leveling Actuator

Houston METRORail

CAF USA

Light Rail Vehicle

Quantity of vehicles: 39

Equipment quantities: 468

Cincinnati streetcar

CAF USA

Light Rail Vehicle

Quantity of vehicles: 6

Equipment quantities: 48

Kansas City streetcar

CAF USA

Light Rail Vehicle

Quantity of vehicles: 4

Equipment quantities: 32

Boston Green Line

CAF USA

Light Rail Vehicle

Quantity of vehicles: 12

Equipment quantities: 192