Figure 1: Schematic of BSPD

The BSPD PCB is located in the front Sensor-Node (Where the main PCB for sensor signal processing resides), in which a separate compartment is created to ensure the BSPD can be separated sealed without affecting other parts in the same housing. The current sensor and the brake pressure sensor are connected directly to the BSPD. The datasheet of the sensors used are shown in reference. [1] [2]

For Out-of-Range signal such as Open circuit, Short circuit to ground, Short circuit to supply voltage, pull-down resistors (R3 and R4) are used to ensure that they are out of the valid range determined by the reference voltages (Current_ref, Brake_ref and low_ref in schematic). Once this happens, the photovoltaic relay (U4) will open the shutdown circuit and the AIRs.

As shown in the schematic, the Error Latching is realized with the RC Combination R21 and C13. In case of an Error the open collector output of U1A is discharging C13 via a small resistor R21, causing U1B to open the Shutdown Circuit. If the Error is removed, C13 is charged via R20 in series with R21, resulting in a time delay of 11.65s. (as shown below)

$$-(ln(1 - 3{,}44\,\text{V}/5\,\text{V})) \cdot 10\,\mu\text{F} \cdot 1\,\text{M}\Omega = 11{,}65\,\text{s} \tag{1}$$

The test procedure is shown here:

Test Procedure

1. apply external test current to the simulation coil

2. brake hard (with brake pressure $\geq$ 30bar)

Test Current Calculation

$$I_{test} = 5\text{kW}/V_{max} = 5\text{kW}/403.2\text{V}$$
$$= 12.401\text{A}$$

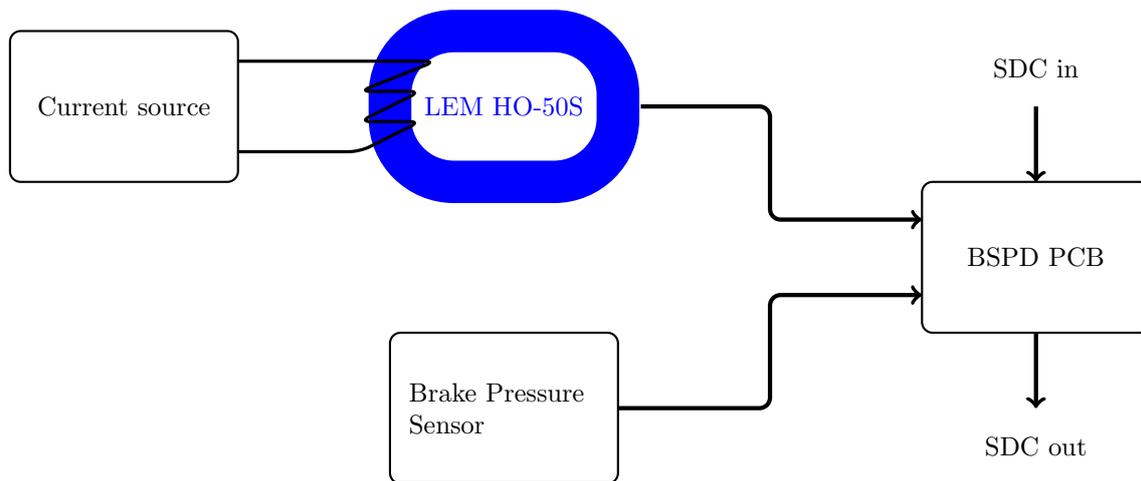12 windings $\longrightarrow$ test current $\approx 1.034\text{A}$

Figure 2: current simulation schematic

Reference

[1] *Current Transducer HO-S series.* https://www.lem.com/sites/default/files/products_datasheets/ho-50_250-s_v7.pdf, 03.2022

[2] *ADZ SME 200bar.* https://www.adz.de/fileadmin/user_upload/downloads/produkte/SME/ADZ_SME_OperatingManual_DE-EN_A.pdf, 12.2010