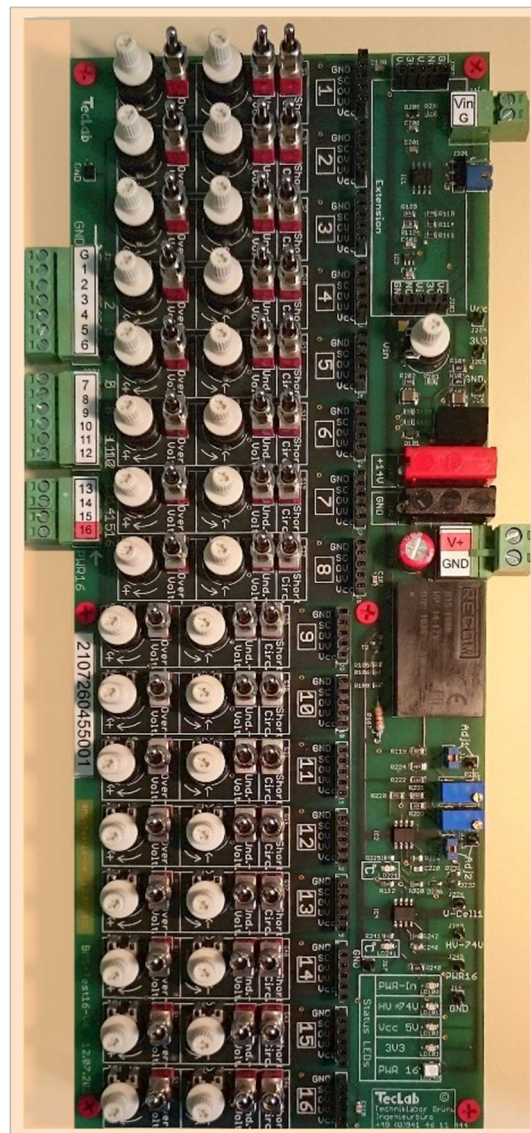


The BMS-Test16 board has been developed as a prototype to simulate Lithium Jonen Battery packs with **2 up to 16 cells**. The cell voltages can be set by a single input-voltage **Vin** in the range of **2 to 4,5V**. An onboard trim potentiometer or an external voltage (set the jumper **J201**) can set **Vin**. The board requires a working input voltage between **14V and 17V @ 0,1A** (the current will increase when a BMS system is connected). The highest cell connector **PWR 16** delivers up to 40 mA current supporting the external BMS circuits. This document describes the board-connectors, interfaces and working voltages.



Techniklabor Grünwald  
Ingenieurbüro  
Cecilie-Vogt-Weg 28  
93055 Regensburg  
0941 46 11 444

**Absolut maximum ratings:**

Maximum power input voltage (J100, J101, J102)	17 V
Maximum power input current @ maximum load	350 mA
Maximum operating voltage on board	74,6 V
Maximum steering input voltage <b>Vin</b>	5 V

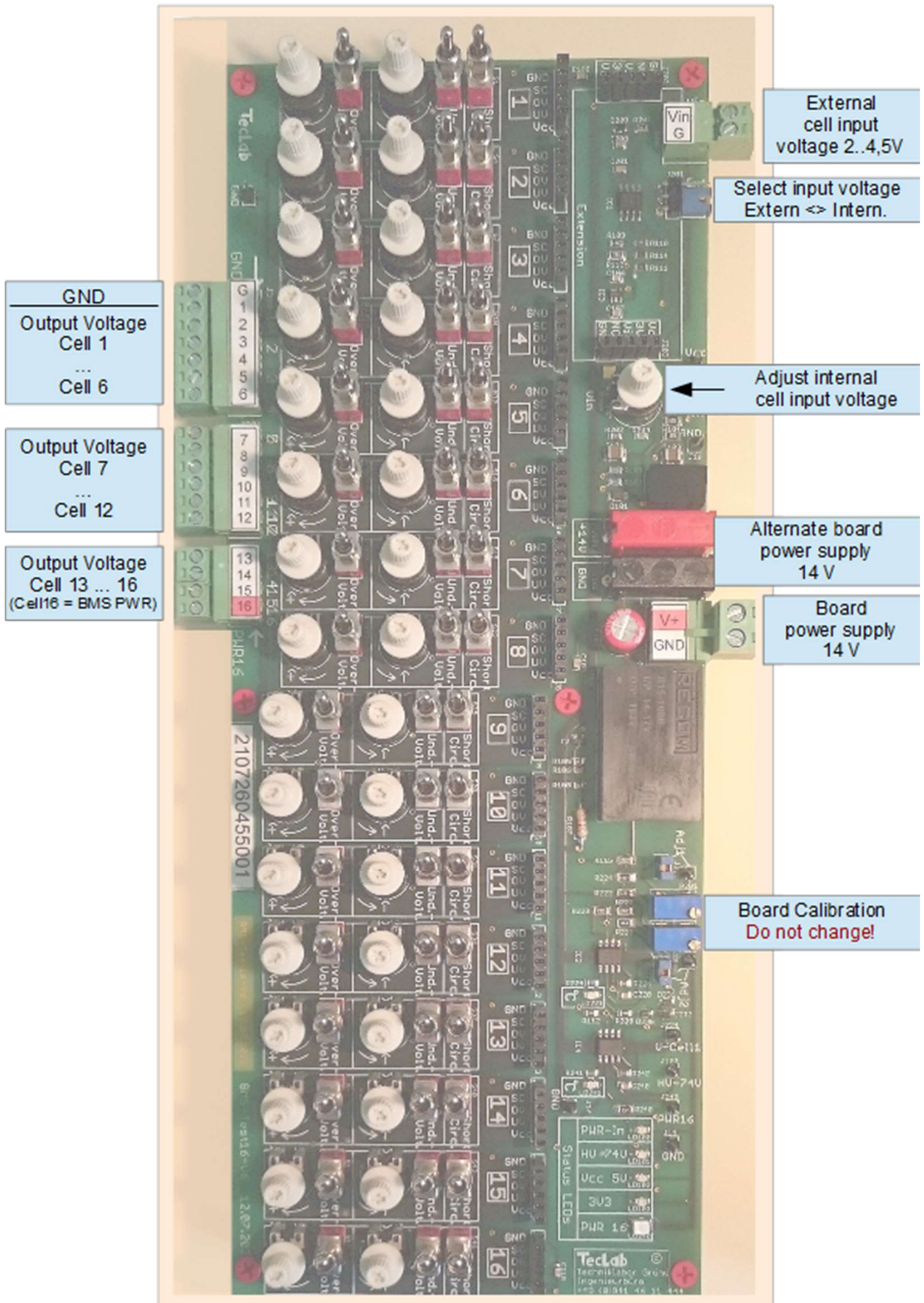
**Recommended operating conditions:**

Power input voltage	14 V
Number of cells	3 up to 16
Nominal operating temperature	0 °C to 50 °C

**Board specific values: Board 2107260454000**

Measured @ 20°C

<b>Maximum Voltage Values</b>			<b>Ripple</b>		
R105 built in (HV-74 adjust)	150	kOhm	HV-74V	24 mVss	HF
TVS D102, P4SMAJ78A	92	V	V-Cell16	6 mVss	HF
HV-74 Voltage	74,5	V	Cell1	2 mVss	HF
V-Cell max	72,5	V	(Tektronix 2445B	150	MHz)
<b>HV-74 Voltage Thresholds</b>					
Switch to 59V below	44	V			
Switch to 74V above	51	V			
<b>Highest Cell Voltage @ Vin</b>					
V-Cell16 @ Vin 4,30V	68,6	V			
V-Cell16 @ Vin 4,40V	70,2	V			
V-Cell16 @ Vin 4,50V	72	V			
<b>Cell Voltage Setting area (each cell element)</b>					
Cell x @ Vin 4,00V	OV min	OV max	UV min	UV max	
	4,010V	6,232V	2,183V	3,064V	
Cell x @ Vin 4,00V	OV max & UV max		OV max & UV min		
OV and UV together	4,223V		2,715V		
Cell x @ Vin 4,00V	OV = 5,77V & UV max		OV = 5,77V & UV min		
OV and UV together	4,000V		2,620V		



**Cell-Element Features**

Each of the 16 cell elements provide the following features:

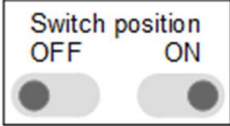
Cell voltage common with all other cell elements. The terminal of cell 16 provides current up to 40 mA to supply a BMS system circuit. If using smaller cell pack than 16 cells, this terminal remains further as BMS supply. Its voltage is the same than the highest cell of the reduced cell pack.

Under voltage (UV) simulation with trim potentiometer for specific under voltage values.

Short circuit (SC) connects the upper cell voltage pin with the upper cell voltage pin of the lower cell so the cell voltage becomes 0 V. SC must also be used to reduce the number of cell packs. E.g. to simulate a cell pack of 10 cells, the SC switches of cell 11 up to 16 must be switched ON.

Over voltage simulation with trim potentiometer for specific under voltage values.

External steering of SC, OV and UV simulation. Connect high level (2.8V to 5V) to the pins to activate SC or UV. Note that OV works in invers mode: Set switch ON and clear OV by setting OV pin high.



Short Circuit (SC) switch to simulate SC or eliminate Cell (\*2)

Under Voltage (UV) switch to simulate lower cell voltage

UV adjust cell voltage: Lower than the other cells in the pack

Over Voltage (OV) switch to simulate higher cell voltage

OV adjust cell voltage: Higer than the other cells in the pack (\*1)

(\*1) Note that the maximum board voltage can be reached and will limit the OV values.

(\*2) To simulate cell packs smaller than 16 cells set the upper cells to short circuit (e.g. for 12 cell pack set cells 13...16 SC). BMS Power connect remains on cell 16.

**Connector for external Cell Steering.**

Connecting with single wires  
Connecting with 6 pin ribbon band cable  
Logic level low: max. 0.8V  
Logic level high: 2.8 ... 5.5V

**Single Wire Connector**  
Wire: AWG 16 to 24 (0,2...1,3 mm<sup>2</sup>)

- Board GND Connection
- Short Circuit (active high)
- Over Voltage (active low, switch ON)
- Under Voltage (achtive high)

**6 Pin Ribbon Cable Connector**

- Pin 1,6 GND
- Pin 2 Short Circuit
- Pin 3 Over Voltage
- Pin 4 Under Voltage
- Pin 5 Vcc (5V)

Plug into single Cell Connector