Temperature Sensors
Accessories

Melcher offers a wide range of battery charger systems consisting of adapted power supplies and appropriate temperature sensors. The (lead-acid) batteries are charged according to the battery temperature and the properties of the battery cells. When the battery is fully charged, it is maintained at the float charge voltage, which represents the optimum point for maximum available energy and optimum life expectancy of the battery. It is essential to place the sensor as close to the battery as possible thus sensing the battery temperature.

The most suited sensor model is defined mainly by three parameters: The nominal battery voltage (e.g. 24 V or 48 V), the temperature coefficient of the cells (e.g. -3.0 mV/K), and the nominal floating charge voltage per cell at 20 °C (e.g. 2.27 V/cell). The latter two are specified in the data sheet of the battery.

The temperature sensors K can be used with all Melcher converters fitted with the standard R-input. This input allows adjustment of the output voltage; see fig. 1. The open R input exhibits a source voltage of 2.5 V with a source resistor of 4 kΩ.

The sensor can directly be connected to the R-input and is powered from the battery voltage, as shown in fig. 2. The sensor supersedes the internal voltage control circuit of the converter and adjusts the output voltage exactly to what is needed for the battery.

> **Note:** Some converters exhibit a current droop characteristic to ease the operation in parallel connection. If the temperature sensor K is connected to the R-input, it cancels the droop characteristic and impedes current sharing. We recommend the use of converters with true current sharing feature (option T).

Different models of battery sensors are available depending on the battery specifications. Table 1 gives an overview of available sensors.

> **Note:** Other types for different cell voltages, temperature coefficients, and cable lengths are available on request.

For example, if the application uses a 48 V battery consisting of 24 cells of 2.27 V, a temperature coefficient of -3.0 mV/K and 2 m cable length, the sensor type is S-KSMH48-2.27-30-2.

Fig. 3 shows the charge voltage depending on the temperature and the battery type. If the sensor is disconnected, the converter output voltage is regulated to $V_{o\,safe}$. This voltage prevents the battery from being overcharged even at high temperature. Overcharging a battery is dangerous and can cause the battery to explode.
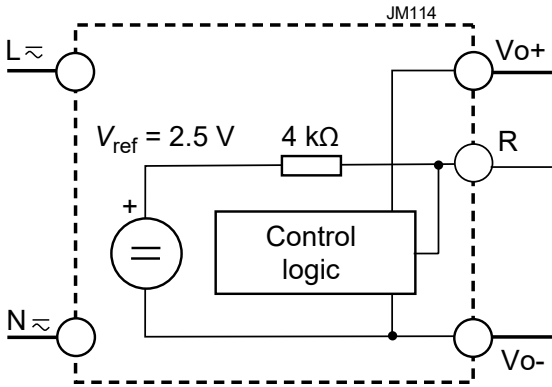
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Fig. 1
Block diagram of Melcher converters suited to be controlled by a battery sensor.
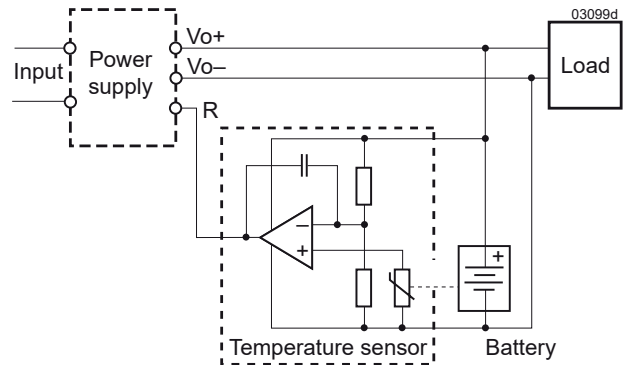

Fig. 2
Block diagram of the sensor.

Table 1: Sensors for converters with standard R input

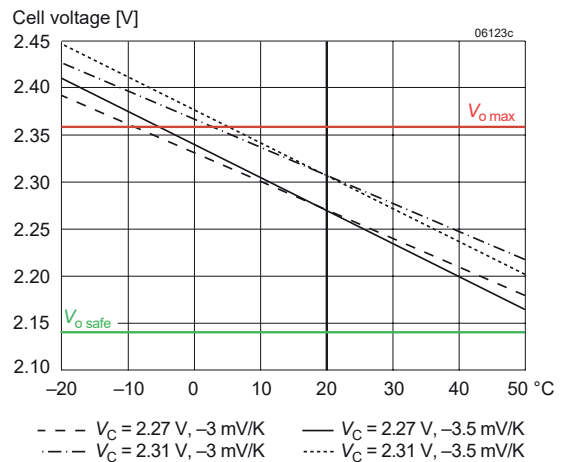| Battery voltage nom. [V]	Sensor type	Cell voltage [V]	Cell temp. coefficient [mV/K]	Cable length [m]
12	S-KSMH12-2.27-30-2	2.27	−3.0	2
12	S-KSMH12-2.27-35-2	2.27	−3.5	2
24	S-KSMH24-2.27-30-2	2.27	−3.0	2
24	S-KSMH24-2.27-35-2	2.27	−3.5	2
24	S-KSMH24-2.31-35-0	2.31	−3.5	4.5
24	S-KSMH24-2.31-35-2	2.31	−3.5	2
24	S-KSMH24-2.35-35-2	2.35	−3.5	2
48	S-KSMH48-2.27-30-2	2.27	−3.0	2
48	S-KSMH48-2-27-35-2	2.27	−3.5	2

Fig. 3
Float charge voltage vs temp. for different temp. coefficients.

Fail Safe Operation and Suitable Converters

To prevent batteries from overcharging but still maintain a minimum charge in case of interruption of the cable from the sensor to the converter, we offer models with special nominal output voltage setting; see table 2. These converters differ from the respective standard models in the nominal output voltage and output current setting. Without the sensor connected to the R-pin, the output voltage is set to $V_{o\,safe}$. This voltage is higher than the nominal battery voltage such avoiding discharging the battery, but still lower than the theoretically needed float charge voltage. As soon as the sensor is connected to the R-pin, the output voltage will be set to the correct value. This is essential for best energy and battery life time.

Table 2: Special models for battery charging

V_{nom} [V]	V_{safe} [V]	P_o = 50 W	P_o = 70 W	P_o = 100 W P_o = 125 W	P_o = 150 W	P_o = 250 W	P_o = 280 W	P_o = 375 W P_o = 500 W
12	12.84	LM1781-9RG LOK4140-2RLDG	LH1781-2R	LS4740-9ERG[2] LWR1140-6EM1G	LK4740-9ERG CK1740-9RG[3]	LWN1140-6EM1G		
24	25.68	LM1782-7R LOK4240-2RLDG	LH1782-2R	LS5740-9ERG[2] LWR1240-6EM1G	LK5740-9ERG CK2740-9RG[3]	LKP5740-9ERG LWN1240-6EM1G	LKP5741-5ERG	LXR1240-6M1G LXN1240-6M1G
36	38.52	LM1783-9RG	LH1783-2R	LWR1840-6EM1G		LWN1840-6EM1G		LXR1840-6EM1G XN1840-6EM1G
48	51.36	LM1784-9RG LOK4740-2RLDG	LH1784-2R	LS5740-9ERG[1,2] LWR1740-6EM1G	LK5740-9ERG[1] CK2740-9RG[1,3]	LKP5740-9ERG[1] LWN1740-6EM1G	LKP5741-5ERG[1]	LXR1740-6M1G LXN1740-6M1G
60	64.2	LM1785-9RG	LH1785-2R					

[1] Both outputs connected in series.
[2] Similar models with DC input (DS/LS1740, DS/LS2740) are available as well.
[3] DC input; DK/LK1740 and DK/LK2740 are available as well.

Not for new designs

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