Claims

1. A voltage source converter comprising

- a half bridge (11, 31-34) with two current valves (12, 13, 35, 36) connected in series and configured to be connected to opposite poles (6, 7) of a DC source/load, each said current valve comprising a semiconductor device (15, 16) of turn-off type and a rectifying diode (17, 18) connected in anti-parallel therewith, a midpoint (14) of the half bridge between the two current valves forming an AC side of the converter and being configured to be connected to an AC load/source (9), and
- a gate drive unit (21) having a first gate drive part (19) configured to control the semiconductor device of a first of the current valves and a second gate drive part (20) configured to control the semiconductor device of the other, second of the current valves to turn on and off according to a Pulse Width Modulation pattern for creating an AC fundamental voltage and current on said AC side,

wherein the converter comprises an electric current measuring arrangement that comprises at least one of

a) a member (22, 23) configured to measure the voltage drop across the rectifying diode (17, 18, 57) of one of said current valves when it is conducting, and accordingly in the case of a said semiconductor device in that current valve the backward voltage drop of that device, when said gate drive part is controlling the semiconductor device of the other current valve to be off, and

b) a member (22, 23) configured to measure the voltage drop across a said semiconductor device (15, 16, 58) when it is conducting controlled by said gate drive part to be turned on, and accordingly the forward voltage drop of that semiconductor device,

and that the arrangement further comprises a member (25, 44) configured to measure the temperature in the vicinity of the current valve for which a voltage drop measurement is

carried out and a calculating unit (24, 43) configured to receive voltage drop measurement values and temperature values associated with the same of said current valves and use this information to calculate and deliver a value of the current flowing through this current valve, wherein said voltage source converter comprises a current sensor (39-41) configured to measure the current between said midpoint of the half bridge and said AC load/source (9) and a member (45) configured to compare the current value delivered by said calculating unit (43) and the value of the current measured by the current sensor and by the result of this comparison deliver a judgement of the state of said sensor (39-41).

2. A voltage source converter according to claim 1, **characterized in that** it comprises three said half-bridges (31-33) each having a said gate drive unit (21) with said first and second gate drive parts (19,20) for creating a three phase AC fundamental voltage and current on said AC side.

3. A voltage source converter according to claim 2, **characterized in that** at least two of the three half bridges (31-33) has a current sensor (39-41) configured to measure the current between said midpoint of the half bridge and said AC load/source (9).

4. A voltage source converter according to claim 3, **characterized in that** said three half bridges (31-33) comprises a said voltage drop measuring member (22, 23) and a member (38) configured to compare the current value delivered by said calculating unit (43) for the half bridge and the value of the current measured by the respective current sensor (39-41) and by the result of this comparison deliver a judgement of the state of the sensor.

5. A voltage source converter according to claim 4 or 5, **characterized in that** it comprises a further half bridge (34)

with two current valves (35, 36) connected in series and configured to be connected to said opposite poles (6, 7) of a DC source/load, a first (35) of said current valves comprising a semiconductor device of turn-off type and a rectifying diode connected in anti-parallel therewith, and the other current valve (36) comprising at least a rectifying diode with the same conducting direction as the rectifying diode in the first current valve as seen in the direction of said series connection, and with a resistor (37) connected in parallel with said other current valve (36), that it comprises a gate drive unit (21) having a gate drive part configured to control the semiconductor device of said first valve (35) to turn on and off making this half bridge (34) functioning as a brake chopper while burning electric power in said resistor (37) when having the semiconductor device of the first valve turned on, that said electric current measuring arrangement has a voltage drop measuring member applied to this further half bridge, and that said calculating unit (43) is configured to use information about the voltage drop measured by this member and the temperature associated with the current valve in question to calculate and deliver a value of the current flowing through the resistor.

6. A voltage source converter according to claim 5, **characterized in that** it comprises a member (38) configured to compare the value delivered of the current flowing through the resistor (37) with an expected resistor current value and deliver a judgement of the state of the resistor by the result of this comparison.

7. A voltage source converter according to claim 5 or 6, **characterized in that** it is configured to have said half bridges thereof connected to a DC source/load (6, 7) in the form of a DC supply line, and that it comprises a unit (42) configured to determine the line current flowing between said DC supply line and the voltage source converter by combining the results of current values delivered by the current sensors (39-41) of the

three half bridges and the value of the resistor current calculated.

8. A voltage source converter according to any of claims 1-7, **characterized** in that the semiconductor devices (15, 16, 58) of the current valves (12, 13, 35, 36, 56) are IGBTs (Insulated Gate Bipolar Transistors) or MOSFETs (Metal Oxide Semiconductor Field Effect Transistors).

9. A track-bound vehicle (1) having at least one converter according to any of claims 1-8.