CLAIMS

1. A safety static relay cell (6) comprising:

- an input terminal (16) and an output terminal (18),

- at least one main switch (12) in series with the input terminal (16) and the output terminal (18), and

- a control unit (20) configured to control the at least one main switch independently (12),

characterized in that it comprises a leakage current detector (30), which can detect a leakage current in the at least one main switch (12),

the leakage current detector (30) comprising:

- a measuring module (34) for measuring a leakage voltage (V_+), the leakage voltage (V_+) being representative of the leakage current,

- a periodic voltage signal generator (42), which can generate a comparison signal (V_-), and

- a comparator (38) which can compare the value of the leakage voltage (V_+) and the value of the comparison signal (V_-), and to give, as output, a leakage current detection signal (V_{OUT}) having a duty factor (α) representative of the leakage current.

2. The cell (6) according to claim 1, wherein the control unit (20) comprises a reception module (88) coupled at its output to the comparator (38) in order to receive the leakage current detection signal (V_{OUT}), and a computing module (92) which can compute the duty factor (α) of the leakage current detection signal (V_{OUT}).

3. The cell (6) according to claim 1 or 2, wherein the periodic signal generator (42) is a sawtooth signal generator, the generated comparison signal (V_-) being a sawtooth signal.

4. The cell (6) according to claim 3, wherein the periodic signal generator (42) comprises a DC current source (70), a capacitor (66) and a secondary switch (74), the DC current source (70) being able to charge the capacitor (66), the secondary switch (74) being able to short-circuit the capacitor (66) when it is in the closed position in order to cause the discharge of the capacitor (66), and being controlled by a discharge control signal (V_{DC}) transmitted by the control unit (20).

5. The cell (6) according to any one of claims 1 to 4, wherein the module (34) for measuring the leakage voltage (V_+) comprises a voltage divider bridge (50, 52), the measuring module being connected to the terminals of the main switch or of the assembly of the main switches.

6. The cell (6) according to any one of the preceding claims, wherein the cell (6) comprises at least two main switches (12) in series.

7. The cell (6) according to any one of the preceding claims, wherein each main switch (12) includes a transistor (26) and a diode (28) connected in antiparallel with the transistor (26), and wherein at least one transistor (26) is a field-effect transistor, preferably an insulated-gate field-effect transistor.

8. An assembly (5, 105) of static relay cells, characterized in that it comprises a first static relay cell (6, 106) and a second static relay cell (7, 107) in series, each cell being according to any one of the preceding claims, wherein the output terminal (18) of the first cell (6, 106) is connected to the input terminal (16) of the second cell (7, 107), the control units (20) of each cell being able to communicate with one another.

9. The assembly (5, 105) of static relay cells according to claim 8, further comprising a third static relay cell (108), a fourth static relay cell (109) and a fifth static relay cell (110), each cell being according to any one of claims 1 to 7, wherein:

- the input terminal (16) of the first cell (6, 106) is connected to the input terminals (16) of the third cell (108) and the fifth cell (110),
- the output terminal (18) of the third cell (108) is connected to the output terminal (18) of the fifth cell (110) and the input terminal (16) of the fourth cell (109), and
- the output terminal (18) of the second cell (7, 107) is connected to the output terminal (18) of the fourth cell (109),

the control units (20) of each cell being able to communicate with one another.