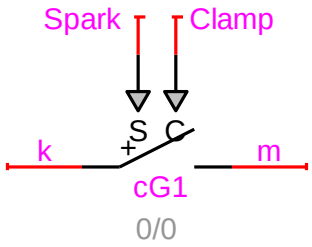
Controlled gap



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1 Description

This device is an ideal gap (switch) type device with two control signals: Spark and Clamp. It has a zero resistance and zero voltage drop when closed and infinite resistance when open. It is a 1-phase device.

2 Parameters and rules

The parameters from the data tab are:

- V_{ig} is the ignition voltage, the minimum voltage required for closing the gap. This voltage should be greater or equal to 0.
- I_{hold} is the holding current. The gap stops conducting when its current falls below this value or crosses 0 when $I_{hold} = 0$. This value is greater or equal to 0.
- Closed at t=0

  This option is used for initializing the simulated network in steady-state solution. When this option is checked the gap is closed in the steady-state solution and its symbol changes to the closed switch symbol.

The control signals are Spark (any signal connected to the S-pin) and Clamp (any signal connected to the C-pin). The Clamp signal action is:

- When $C > 0$ the gap is closed and the Spark (S) signal is ignored.
- When $C < 0$ the switch open, the Spark (S) signal is ignored.
- When $C = 0$ the Spark (S) signal becomes active

The Spark signal (S) action is:

- When $S > 0$

  if the gap is open it becomes closed only when the gap voltage $v_{km} > V_{ig}$

  if the gap is closed it stays closed
- When $S \leq 0$

  if the gap is open it stay open

  if the gap is closed it will open when the absolute value of its current becomes lower than I_{hold}

This is a 1-phase device and it is not allowed to change its pin attributes. It is not allowed to delete any pins. This is an ideal device. Placing several gaps in parallel is acceptable if the gaps are not closed at the same time. When paralleled gaps are closed at the same time, mathematically impossible conditions will result and EMTP will *try* to solve such cases by inserting dummy resistances.

3 Netlist format

```
_cSwGap;cG1;4;4;k,m,Spark,Clamp,
0,0,1,?v,?i,?p,>v,>i,>p,>S,
```

Field	Description
_cSwGap	Part name
cG1	Instance name, any name.
4	Total number of pins
4	Number of pins given in this data section
k	Signal name connected to k-pin, any name
m	Signal name connected to m-pin, any name
Spark	Spark signal name, any name
Clamp	Clamp signal name, any name
V_{ig}	Voltage V_{ig} described above
I_{hold}	Current I_{hold} described above
Closed at t=0	1 means closed in steady-state, 0 means open in steady-state
?v, ?i, ?p	Optional scope requests
>v, >i, >p, >S	Optional observe requests

Device data fields are saved into the ParamsA device attribute.

4 Steady-state model and initial conditions

If the gap is closed at t=0, it is modeled as an ideal closed switch. It is an open-circuit otherwise.

5 Frequency Scan model

Similar to the steady-state.

6 Time-domain model

The gap is modeled by an ideal closed (zero resistance) switch when conducting and by an ideal infinite resistance open switch when turned off.