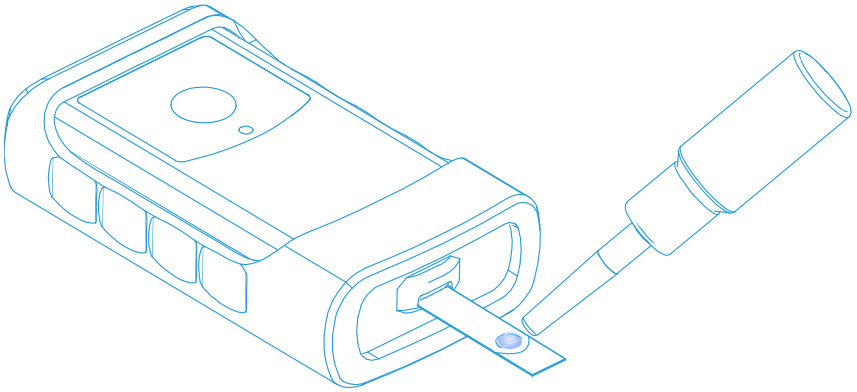
Last document update: August 26, 2025

Application Note



1 Working principle of Drop Detection

The EmStat Go, EmStat4R and the EmStat4T can be equipped with the SPE Connection Module. This Connection Module allows for using Screen Printed Electrodes (sensors) directly with the EmStat Go and EmStat4T potentiostat.
The module contains a switch (**DD_enable)** that allows the module to be set in two modes:

- Drop Detection mode
- Normal mode

When the module is set in the Drop Detection mode (**DD_enable** is High):

- CE is tied to fixed voltage of 3.3 V through a 10 MOhm (Mega-Ohm) resistor.
- RE is tied to ground through a 10 MOhm resistor.
- RE is connected to a comparator with a voltage threshold e.g 0.2 V.

When a drop is present with an impedance < 145 MOhm the comparator will change its state and can be read as a low signal on the **DD_detect** signal.

After the drop has been detected the EmStat can be switched back to Normal Measurement mode (by setting DD_enable to LOW) to start the measurement.

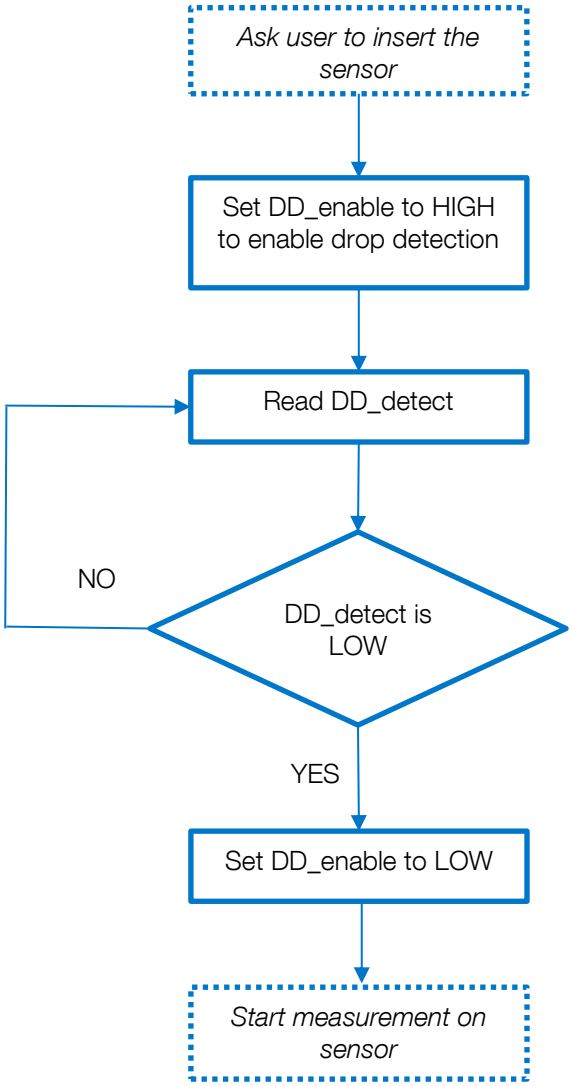
When the drop is present a current between 165 nA (max) and 20 nA (min) will flow from the CE to the RE for as long as it takes for the EmStat to respond to the signal, e.g. 10 ms.

2 GPIO pins used for Drop Detection

Instrument	EmStat Go			EmStat4R	EmStat4T
Module	EmStat3	EmStat Pico	EmStat4M	EmStat4M	EmStat4M
DD_enable	GPIO_D3	GPIO_D3	GPIO_D3	GPIO_D3	GPIO_D0
DD_detect	GPIO_D1	GPIO_D4	GPIO_D5	GPIO_D5	GPIO_D1

DD_enable is active HIGH (LOW=normal measurements)
DD_detect is active LOW (HIGH=no drop detected)

3 Drop detect flow chart



4 MethodSCRIPT code example

The following MethodSCRIPT code example shows how to use the EmStat Go Drop Detection with an EmStat Go with integrated EmStat4M module, or the EmStat4R.

```
e
var p
#set GPIO_D3 (DD_enable) to output
set_gpio_cfg 0b1000 1
#set GPIO D5 (DD_Detect) to input
set_gpio_cfg 0b100000 0
#set DD_enable high
set_gpio 0b1000
#wait 10ms for settling
wait 10m
#read DD_detect
get_gpio p
pck_start
pck_add p
pck_end
#set DD_Enable low to enable normal measurements
set_gpio 0b0000
#DD_detect is active low
if p & 0x20
      #DD_detect is high
      send_string "drop detected: NO"
else
      #DD_detect is low
      send_string "drop detected: YES"
endif
```

For more code examples and information about MethodSCRIPT, see:
https://www.palmsens.com/methodscript