

ForceA

# DUALEX<sup>®</sup>

Optical leafclip meter

Measuring the **chlorophyll**  
and **polyphenols**  
contents in plants.



Non-destructive



Real time results



Any plant leaves

GPS and data logger





## SENSOR

DUALEX® is a **leafclip meter** that can accurately determine the **chlorophyll**, **flavonols** and **anthocyanins** contents in leaves.

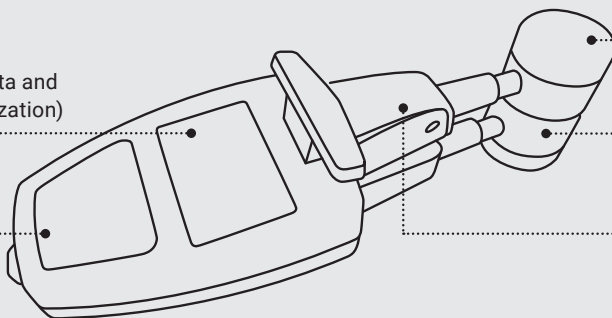
DUALEX® also provides the NBI® (Nitrogen Balanced Index), a **good indicator of plant nitrogen status**.

DUALEX® is mainly used in Plant Sciences for **abiotic stress studies** (physiology, agronomy, ecology, ...).

### Zoom on the product

LCD screen (data and settings visualization)

Keyboard



Light sources

Light detection

Opening handle

# FEATURES



## Non-destructive measurement

Clipping the leaf **doesn't cause any damage**. With DUALEX® it's possible to measure the same leaf multiple times.



## Adapted to experimentation

DUALEX® offers the **possibilities to:**

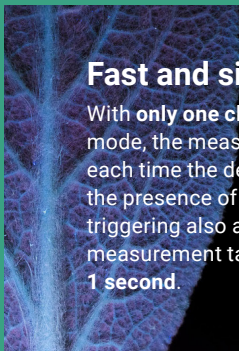
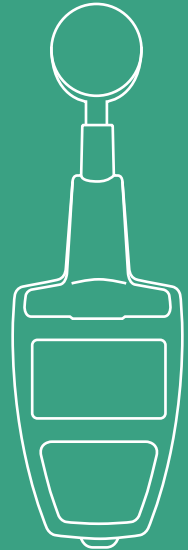
- Remove the last measurement.
- Manage measurement groups (two levels of classification).
- Record more than 10,000 multiparametric data.



## Lightweight and compact

DUALEX® is **easily portable and can be used frequently**.

Not sensitive to ambient light, DUALEX® **can be used in labs, greenhouses or fields**.



## Fast and simple

With **only one clip**, in automatic mode, the measurement is recorded each time the device detects the presence of a leaf (manual triggering also available). One measurement takes **less than 1 second**.

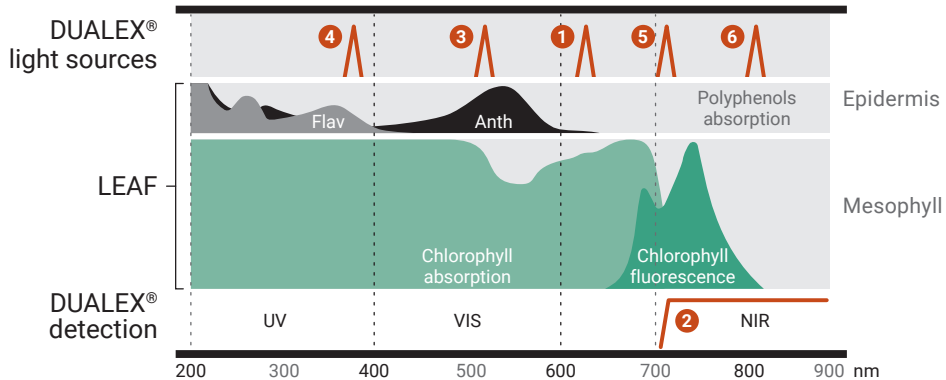
## Reliable and practical

With a measurement area of 19,6 mm<sup>2</sup>, DUALEX® has a good sampling area. Thanks to a 8 cm long clip it's **possible to measure the middle of the leaf** where chlorophyll is less variable and more representative.

# PRINCIPLES

## Accurate measurement of chlorophyll

DUALEX® measures the chlorophyll content of leaf thanks to a transmittance ratio at two different wavelengths. One in the far-red **5** absorbed by chlorophyll and one in the near-infrared **6** as reference.



## The only leafclip sensor to measure flavonols and anthocyanins contents

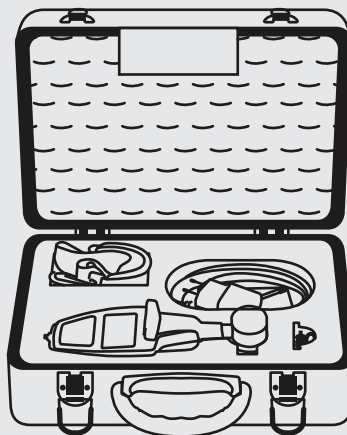
DUALEX® measures flavonols and anthocyanins content of the leaves epidermis thanks to a differential ratio of chlorophyll fluorescence.

Near-infrared chlorophyll fluorescence is measured under a first reference excitation light not absorbed by polyphenols **1**. It is compared to a second sampling specific light absorbed by polyphenols (e.g. green **3** for anthocyanins or UV **4** for flavonols).

Only a fraction of this light reaches the chlorophyll in the mesophyll and can generate near-infrared chlorophyll fluorescence **2**. This principle of measurement is called the screening effect of polyphenols on chlorophyll fluorescence.

# TECHNICAL SPECIFICATIONS

<b>Measuring material</b>	Plant leaves
<b>Measuring system</b>	Transmittance and screening effect on chlorophyll fluorescence
<b>Index measured</b>	Chlorophyll (CHL), Flavonols (FLAV), anthocyanins (ANTH), NBI
<b>Accuracy</b>	5%
<b>Reproducibility</b>	4,5% for CHL, 3,5% for FLAV and ANTH
<b>Repeatability</b>	1,3% for CHL, 2% for FLAV and ANTH
<b>Area measured</b>	19,6 mm <sup>2</sup>
<b>Leaf thickness</b>	1.5 mm maximum
<b>Measurement time</b>	< 1 s
<b>User interface</b>	LCD screen Sound warning
<b>Positioning</b>	Internal GPS
<b>Relative accuracy</b>	< 2,5 m (CEP, 50%, 24 h static)
<b>Storage capacity</b>	10 000 multiparametric data
<b>Data output</b>	.csv file
<b>Data transfer</b>	USB
<b>Operating temperature</b>	From 5 to 45 °C
<b>Battery</b>	Li-ion rechargeable
<b>Autonomy</b>	6 hours
<b>Total weight</b>	220 g
<b>Size</b>	205 x 65 x 55 mm



## **DUALEX® case contains:**

- Dualex leafclip sensor.
- USB cable and charger.
- Hand wrist strap.
- Cleaning swab.

# CONTACT **ForceA**

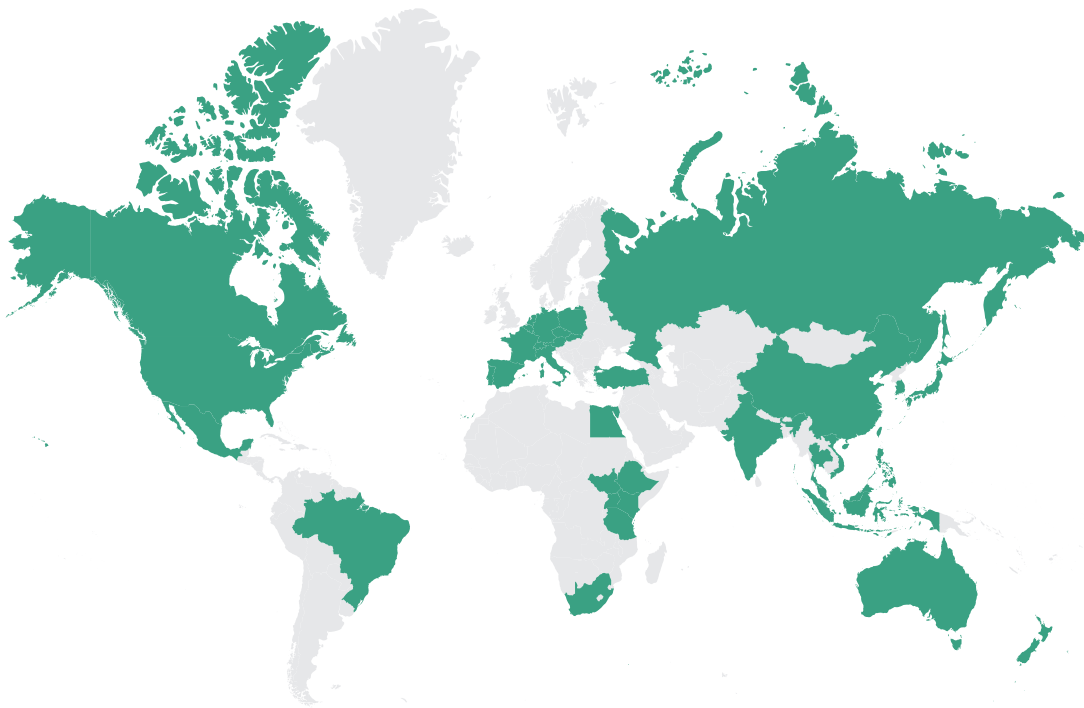


[www.force-a.com](http://www.force-a.com)

[info@force-a.fr](mailto:info@force-a.fr)

## Head office

Centre Universitaire Paris-Sud  
Batiment 503, rue du belvédère, 91400 Orsay  
FRANCE



 **ForceA** Worldwide distributors