

## OPTICAL MEASUREMENTS OF POLYPHENOLS AND CHLOROPHYLL



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Thanks to more than 15 years of research, Multiplex® is a hand-held multi-parameter optical remote sensor for the fast, easy, and non-destructive measurement of constitutive and induced polyphenolics, as well as chlorophyll in plants. Multiplex® uses fluorescence technology with multiple excitations to measure various compounds in berry skins, leaves, fruits and vegetable skins.

### MULTIPLEX® MEASUREMENTS

- Anthocyanin content, epidermal Visible absorbance by FER method
- Flavonol content, epidermal UV absorbance by FER method
- Chlorophyll content, Chlorophyll fluorescence emission ratio
- UV-excited Blue-Green fluorescence (BGF)

#### The advantages of the technology are:

- Simultaneous measurement of various compounds
- Remote and fast measurements (less than a second)
- Active sensing with measurements possible under any ambient light conditions (day or night)
- Non destructive measurements
- No preparation of the plant
- Portable device for field measurements (including an internal GPS)

### POLYPHENOLIC MONITORING MADE EASY

A measurement with Multiplex® takes less than a second by just pressing a button. The settings are easily configured through a user friendly interface on the touchscreen. Data are stored on a SD card and are also displayed on the LCD screen. The data can then be handled with common data presentation softwares. The sensor includes an internal GPS for a georeferencing of the data and field mapping. In its field portable version, Multiplex® has a long life battery designed to keep measuring all a day long and it can then be recharged in three hours.



### APPLICATIONS

When used in conjunction with other agronomical data, Multiplex® can also provide inputs for decision support systems concerning fertilisation requirements, crop quality forecast, weed infestation and presence of fungal pathogens.



# MULTIPLEX® RESEARCH TECHNICAL SPECIFICATIONS



Measured material	Any plant material: leaves, needles, crops, fruits, vegetables, turf, etc.
Measured parameters	Epidermal UV absorbance by FER method (flavonols content) Epidermal Visible absorbance by FER method (anthocyanins content) Chlorophyll fluorescence emission ratio (chlorophyll content) UV-excited Blue-Green Fluorescence (BGF) Several other fluorescence ratios
Measurement process	Main button pressure
Distance	10 cm from material
Measured area	8 cm in diameter (6 cm optional)
Acquisition time	1 shot (250 acquisitions) < 1 s
Storage capacity	1 million multiparametric measurements (512 Mo SD-card)
Modes	One shot or continuous mode
Classification	4 levels
Temperature range	From 5 to 45°C
Light sources	LED (pulsed operation) 4 excitation channels: UV, Blue, Green and Red
Detectors	Silicon Photodiodes 3 detection channels: Yellow (or Blue), Red and Far-Red
User interface	3.2" graphic LCD panel with touchscreen Sound warning
Data downloading	USB connexion for data transfer in continuous mode Data organization compatible with Excel sheets
Power source	External Li-ion rechargeable battery (proprietary)
Autonomy	10 hours
Charging time	3 hours
Total weight	2.5 kg (without battery)
Optical head size	16 cm in diameter X 15 cm in height
Positioning	Internal GPS
Accuracy (pass to pass)	> 1 m
Language	English

Warning: As FORCE-A is continuously improving its products, technical specifications are subject to change without notice.

## REFERENCES

### FER method for flavonoid content, and fluorescence ratio for chlorophyll content:

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Z.G. (2007) Assessment of anthocyanins in grape (*Vitis vinifera* L.) berries using a non-invasive chlorophyll fluorescence method. J. Agric. Food Chem., 55: 1053-1061

**UV-excited BGF:** Cerovic, Z.G., Samson, G., Morales, F., Tremblay, N. & Moya, I. (1999) Ultraviolet-induced fluorescence for plant monitoring: present state and prospects Agronomie: Agriculture and Environment, 19: 543-578; Meyer S., Cartelat A., Moya I. & Cerovic Z.G. (2003) UV-induced blue-green and far-red fluorescence along wheat leaves: a potential signature of leaf ageing. J. Exp. Bot., 54: 757-769