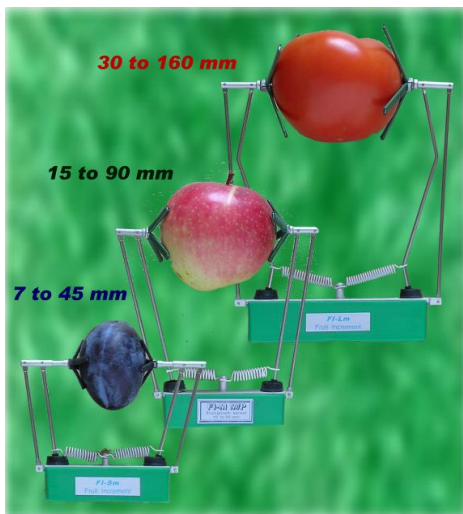




**Bio Instruments S.R.L.**

SENSORS AND SYSTEMS  
FOR MONITORING GROWING PLANTS

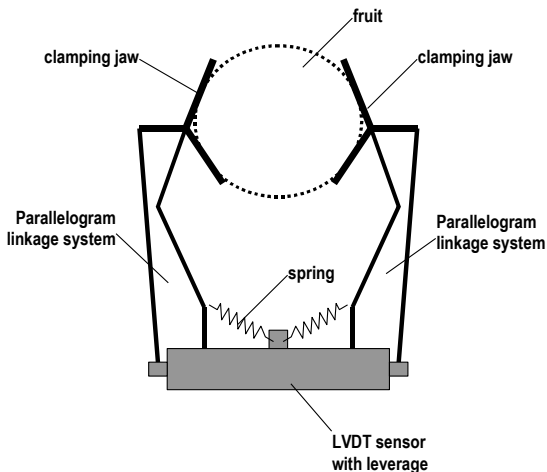
## **FI-ST-VS, FI-MT-VS, and FI-LT-VS Fruit Growth Sensors**

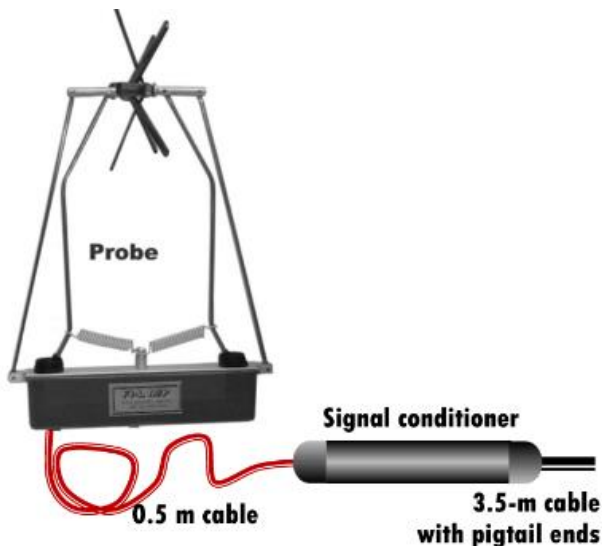


[www.phyto-sensor.com](http://www.phyto-sensor.com)

## ***Introduction***

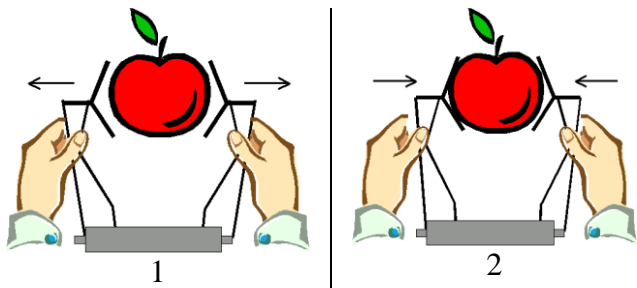
A series of absolute displacement sensors provides recording both size and growth rate of intact rounded (like tomato and apple) and oblong (like cucumber and banana) fruits in three diameter ranges within 7 to 160 mm. Original parallelogram design of moving arms provides firm and straight positioning of the sensor on a fruit under study. The FI-type sensor consists of an LVDT transducer mounted in a special clip, and a DC powered signal conditioner.





## ***Installation***

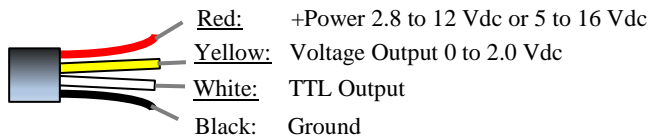
- Choose a fruit for attaching the sensor.
- Move clamping jaws apart so as the sensor can hold the fruit in the desired position.



- Check if the sensor holds the fruit firmly and cannot easily slide down with application of gentle force.
- Secure the sensor's cable on a stem near the fruit in order to prevent occasional movement of the sensor.
- Check the position of the sensor regularly.

## **Connection**

The connection diagram is shown below.



## **Data reading**

Digital outputs have data format: UART TTL,  
Baud Rate = 9600, 8N1.

Decimal data format: XXX.XX (mm).

In a basic version, the UART-TTL operates as following:

1. After power is on, the sensor takes the first measurement within 300 ms approximately, and, then, sends the measured value in ASCII code. For instance, if the measured value is 35.45 mm, the string looks like **35.45<CR><LF>**. Where

**<CR>** - Carriage Return

**<LF>** - Line Feed

2. Then the sensor takes new measurement and sends the new reading every 5 second while power is on.

Upon customer's request, the factory basic protocol can be modified with another (a) the string content (to add header, CRC, etc.), (b) Baud rate, (c) sampling time (any value from 1 s and more).

## ***Calibration table (for Voltage Output)***

Voltage, V	Diameter, mm		
	<i>FI-LT-VS</i>	<i>FI-MT-VS</i>	<i>FI-ST-VS</i>
0,000	30	15	7
2,000	160	90	45

## ***Calibrations equations***

*FI-LT-VS* model:  $D = 65 \times U + 30$

*FI-MT-VS* model:  $D = 37.5 \times U + 15$

*FI-SL-V* model:  $D = 19 \times U + 7$

Where  $D$  – fruit diameter in mm

$U$  – output voltage in Volts

Response time is 0.3 s (after applying the power).

### **Power**

The FI-sensors are to be powered from an external regulated power supply with 2.8 to 12 Vdc output voltage (VS1 modification) or 5 to 16 Vdc (VS2 modification).

## ***Customer Support***

If you ever need assistance with your sensor, or if you just have questions or feedback, please e-mail at [support@phyto-sensor.com](mailto:support@phyto-sensor.com). Please include as part of your message your name, address, phone, and fax number along with a description of your problem.

## Specifications

Model	FI-LT-VS	FI-MT-VS	FI-ST-VS
Measurement range	30 – 160 mm	15 – 90 mm	7 - 45 mm
Resolution, mm	<0.1	<0.05	<0.02
Operating temperature	0 to 50°C		
Temperature effect	<200 ppm FS/°C		
Analog linear output	0 to 2.0 Vdc		
Supply voltage	VS1: 2.8 to 12 Vdc@15mA max.		
	VS2: 5 to 16 Vdc@15mA max.		
Output auto update time	5 s		
Excitation time	0.3s		
Protection index	IP 64		
<u>Cable length:</u>	Customized (4 m total length standard)		



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