DEXLOG Dendrometer Data Logger System

DEX Features

- **Non-destructive**
- **Real-Time measurements**
- **Long-term monitoring**
- **For woody or herbaceous plants, stems or fruits**
- **Weatherproof and rugged**
- **Ranges from 5 mm up to 200 mm diameters available**
- **Long extension cables available, up to 100 ft**

Ordering Information

DEXLOG2
GP1 Logger with two DEX stem and fruit growth electronic dendrometers (DEX70 or DEX100). Includes 10 ft. cables, and factory calibration.

GP1-MP1
Stainless steel mounting plate and fittings for mounting onto a 2" tube or flat surface.

DEXCC
Calibration kit for DEX70 or DEX100

ECWD-25
Cable for Dendrometers, 25 ft., with weatherproof connectors

ECWD-Lxx
Extra length, (XX) added to cable ECWD-25

Complete Plant Growth Monitoring Solution

- **Weatherproof for field applications**
- **Comes complete, programmed and assembled**
- **Can be used on plant stems or fruits**
- **Battery life (9 volt) – typically one year**
- **Works with Laptop PC's or PDA's**
- **Import data into Excel spreadsheets easily**
- **Options for adding soil moisture or weather sensors**

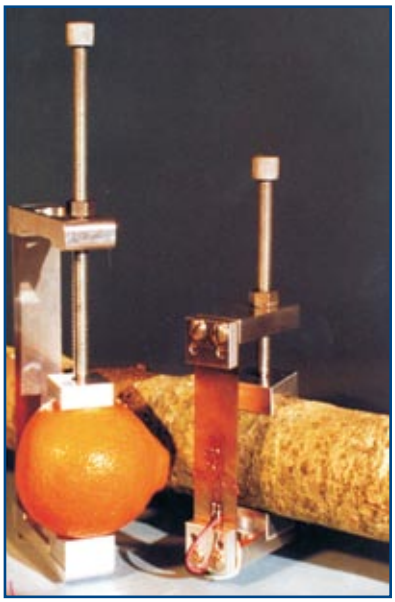
A Complete Logging Solution

The DEX Dendrometer Data Logging System is comprised of a GP1 data logger and (2) DEX electronic dendrometers and can be used to monitor plant growth rate or stress levels over long periods of time. The system can operate completely unattended. The GP1 data logger offers a self-contained solution for monitoring DEX electronic dendrometers, soil moisture and weather sensors. Data can be monitored and displayed in real-time or output to a PC using the supplied RS-232 serial data cable.

The DEX Electronic Dendrometers can be clamped on stems or fruits (citrus, apples, plums, etc.) and can measure very tiny changes in stem or fruit diameter (~0.004 mm). A trend upward represents the growth rate of the plant, whereas a leveling off or trend downward indicates plant stress. This way, growers know when, and how much stress the plants are under. This information can then be used to schedule irrigation or fertilizer applications, as well as keeping track of growth rates over time.

Easy Installation

The DEX dendrometers are connected to the GP1 data logger using a twist-lock connector and extension cable. The dendrometers are then clamped onto a stem or fruit using a screw adjustment knob and suspended with a mono filament string to keep the weight of the dendrometer from pressing on the plant. Thereafter, the change in stem size influences the dendrometer output, which directly converts to mm or inches of expansion from the zero point. A calibration multiplier may be loaded into a logger command, as well as the zero offset, and readings are output directly in mm or inches of change. This data can be stored in the data logger memory or output to a PC or PDA device.



DYNAMAX

Technical Specifications

DEX Dendrometer Specifications

Units	DEX20	DEX70	DEX100	DEX200
MECHANICAL				
Measurement Range	5 - 25	10 - 70	25 - 100	95 - 200
Expansion Range	0 - 5	0 - 13	0 - 13	0 - 13
Dimensions				
Length	65	102	155	263
Width	19	25.4	25.4	38
Height	38	51	76	153
Weight	55 g	180 g	230 g	572 g
Standard Clamping Blocks				
Dimensions Set 1	19 x 19 x 6	25 x 25 x 9.5	25 x 25 x 9.5	25 x 25 x 905
Face Radius	5 mm	70 mm	108 mm	200 mm
Dimensions Set 2	19 x 19 x 6	25 x 25 x 13	25 x 25 x 13	
Face Radius	25 mm	5 mm / 50	25 mm / 75	
Optional Clamping Blocks				
Dimensions	19 x 19 x 6	25 x 25 x 9.5	25 x 25 x 13	38 x 38 x 7
Spherical Radius	25 mm	70 mm	105 mm	500 mm
ENVIRONMENTAL				
Operating Range	-10 to 50° C			
Temperature Stability	0.0025 mm/° C			
Accuracy over 20°C range	0 .050 mm			
ELECTRICAL				
Signal Output Range	±5 mV	±5 mV	±2.5 mV	±2.5 mV
Output Sensitivity[Note1]	0.5 mV/mm	0.22 mV/mm	0.13 mV/mm	0.05 mV/mm
Conversion Mult.[Note1]	2.0 mm/mV	4.5 mm/mV	7.7 mm/mV	20 mm/mV
Output Linearity	±.01 mV/mm	±.006 mV/mm	±.004 mV/mm	±.004 mV/mm
Electrical Noise Limit	±0.01 mV	±0.01 mV	±0.01 mV	±0.01 mV

Note 1
Output sensitivity and multiplier are determined by a 10 point calibration curve from 0 - 3 mm and 5 points from 3.5 to 13 mm. Each sensor is provided with a factory calibration certificate for precise figures.

GP1 Specifications

Input Connections
2 voltage channels
2 temperature inputs or 2 additional Soil Moisture Sensors
2 pulse counters (33kHz & 50Hz)
1 WET Sensor input
Control Outputs
1 smart relay (1A)
Readings Stored
600,000
Recording Rate
1 second up to 24 hours
Configuration
DeltaLINK-PC or Pocket DeltaLINK (PDA option)
Communication Options
RS-232 or modem
Sensor Excitation
1 switched logger power
1 5 V precision reference
Power
One 9 V alkaline/lithium or external power supply 11-24 V
Battery Life
~ 1 year
Enclosure Rating
IP67
Temperature Range
-20 to +60° C (with lithium battery)
Size
5.5 x 4.1 x 1.7 inches
(140 x 105 x 45 mm)
Typical Applications
- Monitoring soil moisture
- Logging weather sensors
- Controlling irrigation

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Dendrometers for Fruit and Stem Growth

Ordering information

DEX20
Dendrometer for stems or fruits 20 mm,
3 m cable length.

DEX70
Dendrometer for stems or fruits 10 - 70 mm,
3 m cable length.

DEX100
Dendrometer for stems or fruits 25 - 100 mm,
3 m cable length.

DEXCC
Calibration kit for DEX70 or DEX100

ECWD-25
Cable for dendrometer, 8 m, water proof connector

ECWD-Lxx
Extra length, (XX) added to cable ECWD-25

DEX Construction

- **Milled Alloy - Caliper Body**
- **Stainless steel adjuster & locking nuts**
- **Stainless Steel Flex Band**
- **Four balanced, temperature compensated Strain Gages**
- **Electronics sealed and weatherproofed**
- **Four Stem clamping blocks provided**
- **Optional spherical clamping blocks**
- **0-13 mm expansion range**
- **Calibration Kit available**

The DEX20, DEX70, DEX100 and DEX200 are highly precise electronic dendrometers that measure the growth and size of plant stems and fruits. The effects of environmental factors on the water balance of plants and stem size variations over time are easily monitored with a temperature compensated dendrometer. The DEX is a caliper-style device with a full bridge strain gage attached to a flexible arm. The output signal is then recorded by a datalogger or computer in real time. The millivolt sensor output shows both the diurnal and long term growth of the plant. The device has been used to test plants under conditions of water stress, elevated ozone and other atmospheric pollutants. Applications for screening plants for growth rate and stress tolerance are also common.

Features

- **Nondestructive**
- **Real-Time measurements**
- **Adaptable to computer systems**
- **Long-term measurements possible**
- **Adaptors for woody stemmed, herbaceous plants, and fruits**
- **Weatherproof and rugged for field study**

Installation

The device is connected to a datalogger, clamped onto a stem and suspended with mounting monofilament guides on the center of gravity of each caliper arm which are then attached to the tree or a staked plant. Velcro straps are provided for easy installation on trees or woody plants. The screw adjuster is tightened to adjust the clamping blocks on opposite sides of the dendrometer. Thereafter the change in stem size increases the output, which directly converts to the diameter increase past the point one recorded as the device's zero point. A calibration multiplier may be loaded directly into a logger multiplier command, as well as the zero offset, and thus giving readings directly in mm or inches instead of millivolts. Users may install optional shading and shielding to minimize heating and radiation effects.

Application

A field test was done in an apple orchard in Mattawa, Washington in September 1995. Data was collected over a 15 day period. After the data was acquired, the information was transferred to a personal computer for analysis. Millivolt signals were converted to millimeter units of movement. The initial value of the Dendrometer was then subtracted from subsequent values so that the Dendrometers were zeroed. The effect of temperature was removed by predicting the effect of temperature, then subtracting this value from the data points.

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Dendrometer Specifications

Specifications

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Measurement Range	5 - 25	0 - 70	25 - 100	95 - 200
Expansion Range	0 - 5	0 - 13	0 - 13	3 - 13
Dimensions Length Width Height	 65 19 38	 102 25.4 51	 155 25.4 76	 263 38 153
Weight	55g	180g	230g	572g
Standard Clamping Blocks Dimensions Set 1 Face Radius Dimensions Set 2 Face Radius	 19x19x6 5 mm 19x19x6 25 mm	 25x25x9.5 70 mm 25x25x13 5 mm /50	 25x25x9.5 108mm 25x25x13 25mm/ 75	 25x25x905 200mm
Optional Clamping Blocks Dimensions Spherical Radius	 19x19x6 25 mm	 25x25x9.5 70 mm	 25x25x13 105mm	 38x38x7 500mm
ENVIRONMENTAL				
Operating Range		-10 to 50° C		
Temperature Stability		.0025 mm/° C		
Accuracy over 20°C range		.050 mm		
ELECTRICAL				
Signal Output Range	±5 mV	±5 mV	±2.5 mV	±2.5 mV
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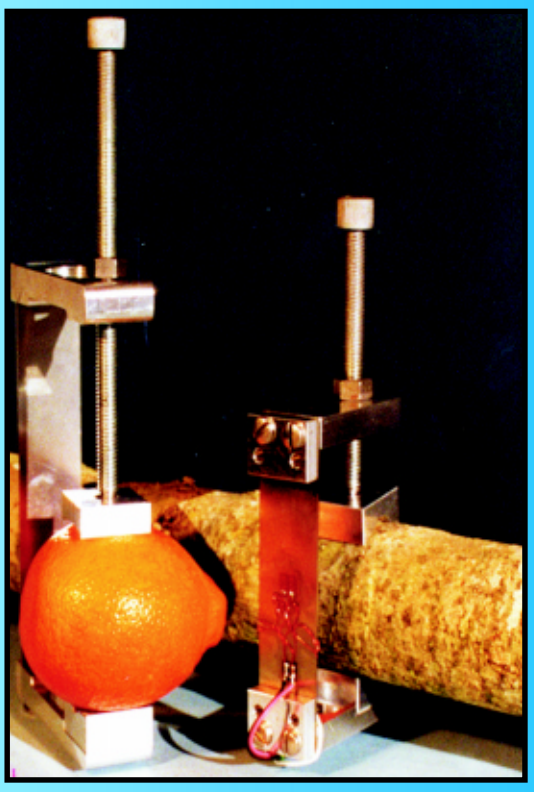

Logger Operation

- **Sensitivity Range ± 0.005mm**
- **Wires directly to datalogger**
- **One differential channel per sensor**
- **Typical excitation 500 mV**
- **Excitation Input Impedance 350 Ohms**
- **Single command for Campbell Scientific and Delta-T loggers per sensor**
- **3m cable standard, 8 m (-L25) to 33 m cable optional w/sealed connectors**

DEX20 Dendrometer measuring the growth of a navel orange.