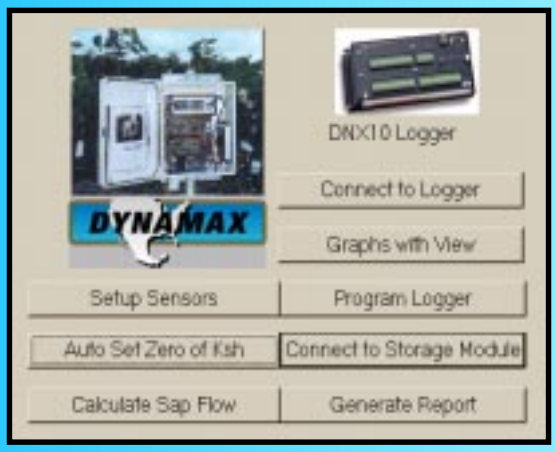
Flow32 Sap Flow System

Flow32 - As invaluable in the field as it is in the laboratory



Using the Flow32 is now even easier just, "Point and Click"

Dynagage Respected Throughout the World

The Dynagage Flow32 Sap Flow system and Dynagage sensors have been servicing research Plant Scientists throughout the world for over 10 years. Now, through our commitment to developing plant water relations tools, Dynamax is proud to announce the latest improvement to this proven technology with the new Flow32-WIN Windows[tm] Based software. The FL32-WIN software makes the Flow32 system easier than ever before. New powerful functions include auto zero and gage stability checking. Sap flow data recalculation and automatic charting with an Excel[tm] Macro link makes the system a superior water relations measurement system. Sap Flow has never been this easy and powerful.

Dynagage sap flow sensors are the most accurate and reliable sensors available for measuring plant sap flow. Dynagage is now a key technique in modern water management, hydrology, crop studies, plant water relations and biomass production.

Applications

Sap flow measurements have an almost unlimited number of applications. Sap-flow transpiration rates provide commercial benefits from accurate irrigation schedules, improved irrigation set points and real crop ET coefficients. Sap flow is key data to model annual forest growth rates and conduct environmental remediation projections. After all, who can tell better than the plant how much water is consumed under varying conditions.

Below are examples of research and commercial industries where the Flow32 Sap Flow System is actively applied:

Agriculture
Agroforestry
Crop Physiology
Environmental
Forestry
Genetic Engineering
Horticulture
Hydrology
Irrigation
Mining Rehabilitation
Orchards
Phytoremediation
Urban Forestry
Viticulture

Features

- **No calibration**
- **Real-time Sap flow**
- **Direct transpiration readings**
- **Non-invasive sensors**
- **Modular and expandable system**
- **Windows software**
- **Automatic power down battery conservation**
- **Auto Ksh zero stability algorithm - expert software**
- **Auto Ksh zero recalculation from saved data sets**
- **AVRDC dual regulator - mixed stem and trunk gages**

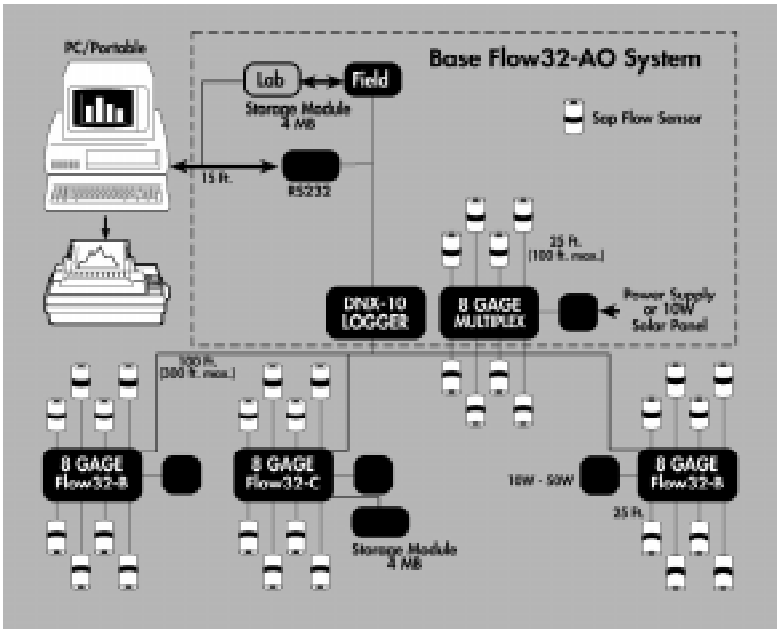
Flow32 Dynagage Sensors

Dynagage Energy Balance sensors measure the amount of heat carried by the sap, which is converted into real-time sap flow in either grams or kilograms per hour. The sensors are non-intrusive and not harmful since the plants are heated up by only 1° C to 5° C typically. The principles of heat balance sensors consist of a scientifically proven mass flow method. Over 70 references published in technical journals cover applications with all major crops and many tree species. Unlike other methods, Dynagages require no calibration since sap flux is directly determined by the energy balance and rates of heat convection by sap flow.

The need for sap flow measurements is great, because it is an affordable and practical way to measure the water use by plants of agricultural, economic, and ecological importance. Plants in greenhouses, nurseries, farms, vineyards or in natural environments can be measured with the same ease.

Benefits

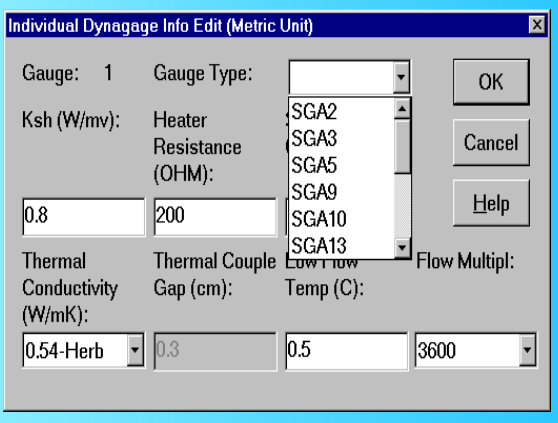
Absolute measurements
Range of gage sizes 2- 150 mm, 0.1” to 6 ” dia.
Harmless, conforms to the plant stem
Reusable & portable
Modular system
Expandable



The Base Flow32-AO system measures up to 8 plants. By adding a combination of Flow32-B & Flow32-C modules, 32 plants can be monitored and sap flow logged for each plant.

Each Dynagage sensor includes reference thermocouples, a thermopile, heating strip, foam insulation and a reflective weather shield to eliminate external thermal gradients.

Dynagage Setup

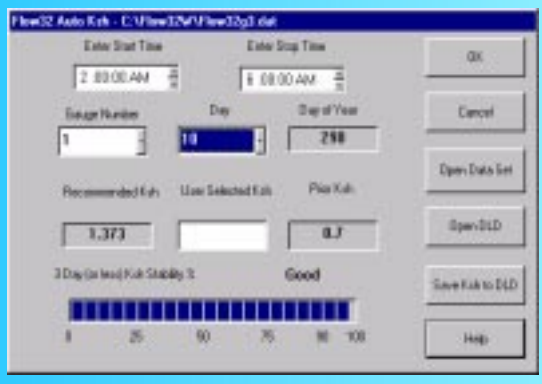


Using the new Graphical User Interface (GUI) each gage and plant can be set up by selecting it from the drop down menu and entering the required parameters. Individual parameters for each gage can be modified quickly and easily without the need to step through the whole program.

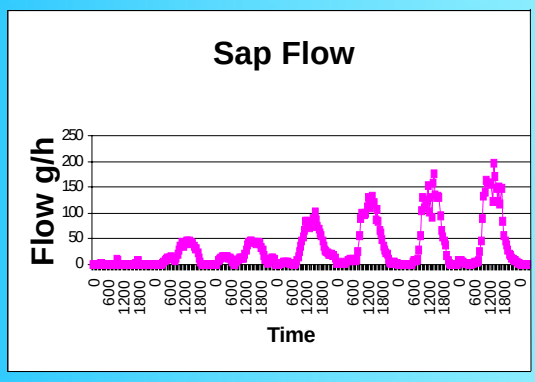
Flow32 Windows Software

System Setup

Auto Zero - KSH



Auto Charting Graphics



The new Windows software interface allows even easier setup of the Flow32 system. Windows GUI accesses and edits each sensor and plant parameters without the need to progress throughout the full program. Each screen is conveniently and logically displayed. One may quickly and intuitively complete the required setup stages. Drop down menus provide specified ranges for each individual sensor parameters. A preview screen allows you to see your changes as you make them.

Software Features

- **Express setup with Dynagage default values**
- **Auto Zero Set of KSH**
- **Gage KSH stability checking**
- **Sap flow data recalculation**
- **Auto charting graphics - Excel and Quickview**
- **Power conservation settings**
- **Low Flow Temperature Cut Off**
- **Noise Suppression Frequency Adjustment**

A new express setup feature is possible using Dynagage default values and Windows Copy & Paste functions. You can quickly add multiple sensors that share the same basic configuration information. This is a fast way of setting up large sap flow systems.

Expanding your system with Flow32-B and Flow32-C Modules is easily handled by the same software. You simply select the new number of Dynagages you intend to measure from the drop-down menu and the software does the rest. Each additional module selected automatically reprograms the logger to record the additional signals and calculated results.

Perhaps the most powerful new feature of Flow32-WIN Windows software is the Auto Zero function. Many factors such as plant growth or unusual temperature fluctuations can cause the zero set values to vary over time. The Auto Ksh function allows one to automatically check and select best value for each days data. The powerful algorithm, smooths, then averages the minimum Ksh values within a predawn period. Then a stability check verifies Ksh over three consecutive days and confirms satisfactory gage performance or warns that a manual check of the sensor is required.

If a new Ksh value is recommended by the software, all previous data can be recalculated and graphed with the best zero set. Similarly, old data sets can be read into the Flow32-WIN Windows software and be recalculated with operator specified parameters. The Sap flow recalculation function imports the old data set together with the prior setup information. The user simply selects the gage of interest and clicks the Calculate Sap Flow icon. Then one automatically imports the data with a new Ksh into Excel where flow is recalculated and graphed. Excel Office 97 (or a later version) is required on your PC for this feature to operate.

DYNAMAX

Flow32 Specifications

Model No.	Stem Diameter* Min	Max	TC Gap	No. TC Pairs	Gauge Height	Total Height	Input (V)	Power (W)
Micro-Sensors								
SGA2-WS	2.1	3.5	0	1	35	70	2.3	0.05
SGA3-WS	2.7	4	0	1	35	70	2.3	0.05
SGA5-WS	5	7	3	2	35	70	4.0	0.08
Stem Gages								
SGB9-WS	8	12	4	2	70	180	4.0	0.10
SGA10-WS	9	13	4	2	70	180	4.0	0.10
SGA13-WS	12	16	4	2	70	180	4.0	0.15
SGB16-WS	15	19	5	2	70	200	4.5	0.20
SGB19-WS	18	23	5	2	130	250	4.5	0.30
SGB25-WS	24	32	7	2	110	280	4.5	0.50
Trunk Gages								
SGB35-WS	32	45	10	4	255	460	6.0	0.90
SGB50-WS	45	65	10	8	305	505	6.0	1.40
SGA70-WS	65	90	13	8	410	610	6.0	1.60
SGA100-WS	100	125	15	8	460	660	8.5	4.00
SGA150-WS	150	175	20	8	900	1140	9.0	13.0

* All measurements are in millimeters unless otherwise stated

Flow32 System Specifications

Datalogger	DNX10 with Custom Dynagage Macro
Base Inputs	6 Differential Channels - Analog
Channel Expansion	AM416 Relay multiplexer
Expanded Inputs	32 Differential Channels - Analog
Sensor Capacity	8 x Dynagages
Range & Resolution	+/- 2.5 mV, 0.33 uV
Voltage Regulation	AVRDC Dual Voltage 1.5 -10 V, 3A ea
Base Memory	128 Kbytes
Expanded Memory	4Mb Removable Module with RS232 Interface
Communications	9-PIN Male RS232 Serial
Battery	7 Ahr / 12V Sealed Lead Acid
Charger	120/220V AC switchable, 4.5A
Sensor Cables	8 x 7.6m (25ft) with Connectors
System Dimensions	43 x 35 x 16 cm
System Weight	11.5 kg

Ordering Information

The base Flow32-AO system does not include gages and is configured with eight 7.6m (25ft) long sensor cables. The customer has the choice between a battery & charger suitable for mains -AC power operation or a 10 watt solar panel for field applications. You must specify your choice when ordering.

To complete your order, choose a selection of gage sizes suitable for your application. If you require cable lengths longer than 7.6m (25ft) please request these at the time of ordering and the specified length will be added prior to shipping.

For field applications a solar panel larger than the 10 w panel offered may be required. You can use the solar panel calculations spreadsheet available from the Dynamax support site in www.dynamax.com to calculate the size and number required, or ask a customer representative for assistance.

Main Components

FLOW32-AO - 8 Gage System w/o Gages
FLOW32-S4 - 4 Gage System w/o Gages
Dynagages - Select Gage Size & Quantity
FL32-WIN-U - Software update for systems prior to 7/1/2000. GUI-setup and analysis utilities, PC208W Windows logger software support. Two CDROMs with new manuals.

Optional Items

Cables

ECW-25 - Extra Cable Length 25' (7.6m)
ECW-50 - Extra Cable Length 50' (15.0m)
ECW-75 - Extra Cable Length 75' (22.8m)
ECW-100 - Extra Cable Length 100 ' (30.5m)
MEC - Sealed, Cable Locking Connectors recommended for cables over 15 m.

Solar Panels

MSX20R - 20 Watt Solar Panel
MSX30R - 30 Watt Solar Panel
MSX53R - 53 Watt Solar Panel

Accessories and Spares

AVRDC - Adjustable Voltage Regulator
CHG120 - 12V Battery Charger 120/220V
BA7A - 7Ah Sealed Lead Acid Battery
EC5 - Bare Wire Replacement 5 ft cable
TFE - Ease Release Teflon Wax installation spray compound (8 oz, 225 ml)

System Expansion

FLOW32-B - Eight Gage expansion kit
FLOW32-C - Eight Gage kit w/ 4Mb Memory
FL32-WK2 - Weather Expansion kit - includes tripod and Dynamet sensors