

# Flow4™ Sap Flow Logger-Irrigation Control

US Patent No 7280892



Flow4 contains a datalogger with 17 input channels, two pulse inputs, voltage regulators and communications in single instrument.

## Ordering Information

**FLOW4-DL** Sap flow datalogger. For logging real-time sap flow, soil moisture and rainfall. Monitors (4) Dynagage sap flow sensors, (4) 25 ft. cables (w/ quick connect and extension terminals), weatherproof enclosure, RS-232 cable (15 ft.), setup/data retrieval software, 5 Ah battery and 120/220 V charger, pole mounting kit, U bolts.

**FLOW4-IS** Automatic irrigation, water balance System. Same as above with irrigation alarm/valve control output, 24 Vac relay, and external sensor cables.

### Dynagage Sap Flow Sensors

<b>SGC50</b>	Stem Gage 2" (50 mm)
<b>SGC40</b>	Stem Gage 1-1/2" (40 mm)
<b>SGC25</b>	Stem Gage 1" (25 mm)
<b>SGC19</b>	Stem Gage 3/4" (19 mm)
<b>SGC16</b>	Stem Gage 5/8" (16 mm)
<b>SGC13</b>	Stem Gage 1/2" (13 mm)
<b>SGC10</b>	Stem Gage 3/8" (10 mm)
<b>SGC9</b>	Stem Gage 0.35" (9 mm)
<b>SGC5</b>	Stem Gage 0.2" (5 mm)
<b>SGC3</b>	Stem Gage 0.12" (3 mm)
<b>SGC2</b>	Stem Gage 0.08" (2 mm)

Sensors supplied with reflective bubble shield, installation kit and how-to manual.

<b>EXQC-XX</b>	Extra length sensor cables in addition to standard 25', xx-ft. Maximum 125 ft.
<b>TE525-L25</b>	Tipping bucket rain gage
<b>ML2-4</b>	Theta Soil Moisture sensor

### Digital Flow Meters with Calibration

<b>FL4-FLM10</b>	Flow Meter, 1" pipe
<b>FL4-FLM20</b>	Flow Meter, 2" pipe
<b>FL4-FLM60</b>	Flow Meter, 6" with saddle mount

### Irrigation Valves - Schedule 80 PVC

<b>FL4-V1</b>	Relay operated valve 1" PVC pipe
<b>FL4-V2</b>	Relay operated valve 2" PVC pipe

**Flow4-IS**, Irrigation Scheduler, is a stand alone water balance measurement system for irrigation automation based on plant transpiration. Four Dynagage sap flow sensors read crop water consumption. These measurements are compared to rainfall, soil moisture and irrigation water supplied. The water balance or water deficit then determines the amount of water to be replenished at a predetermined interval. The system informs the grower to manually apply a specific volume for the area intended, or the Flow4 may automatically open irrigation valves until the water balance is replenished.

The internal logger collects the sap flow rates, rainfall, and irrigation history for retrieval by PC or remote radio link. Flow4 makes water-efficient crop management easy and precise.

**Flow4-DL** Datalogger is a stand alone water balance measurement system. Four Dynagage sap flow sensors are recorded with all sensor signals, sap flow, and the weighted average for four plants.

Optional sensors for rainfall, soil moisture or solar radiation are recorded at each logging interval. The Flow4-DL stores the irrigation and watering history for direct or remote retrieval. When a PC connects to the Flow4-DL, the detailed log of sensor results may be transferred to spreadsheet files for analysis.

- 12,250 Records
  - 14 days of hourly logs
- Daily water balance log - 1 year
- Automatic zero - No calibration
- Easily portable
- Solar power optional
- Remote communication options
- Sensor range 2 - 50 mm (2") dia.
- Battery backup, fail-safe memory

## Features

- High performance irrigation and water balance logging
- Measures: Plant transpiration, rainfall, soil moisture
- Monitors water applied to crop irrigation zones
- Four Dynagage sensors - expert weighted averages
- History data accessed easily by friendly menu software
- Charts for real-time and History data on the software
- Number of plants per field, plant size automatically factored
- Irrigation adjusted for system inefficiency and evaporation
- Communication interface to any Windows based PC
- Remote communication options Short-haul modem, RF (Radio) Modem, Cellular (GSM) Modem

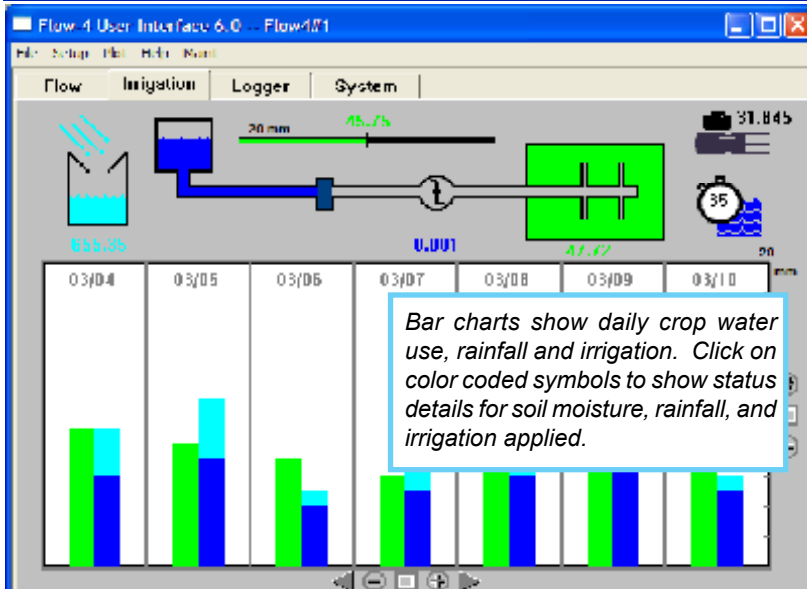
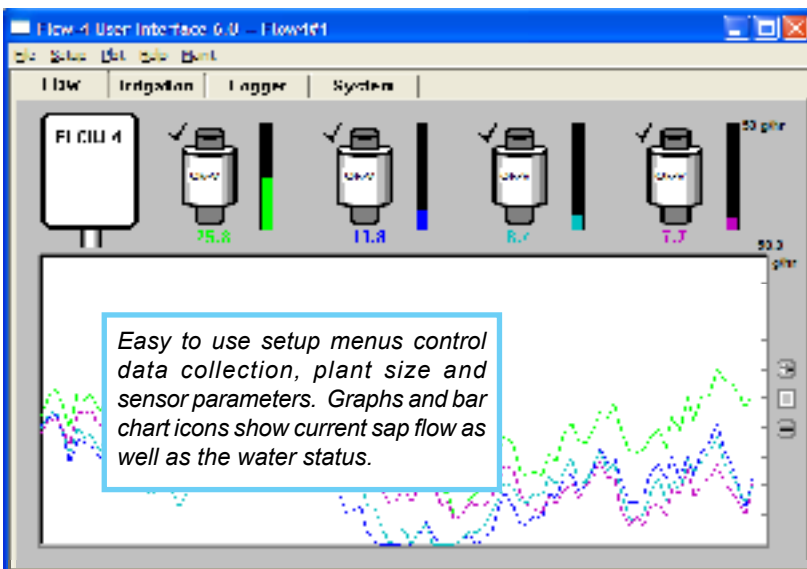
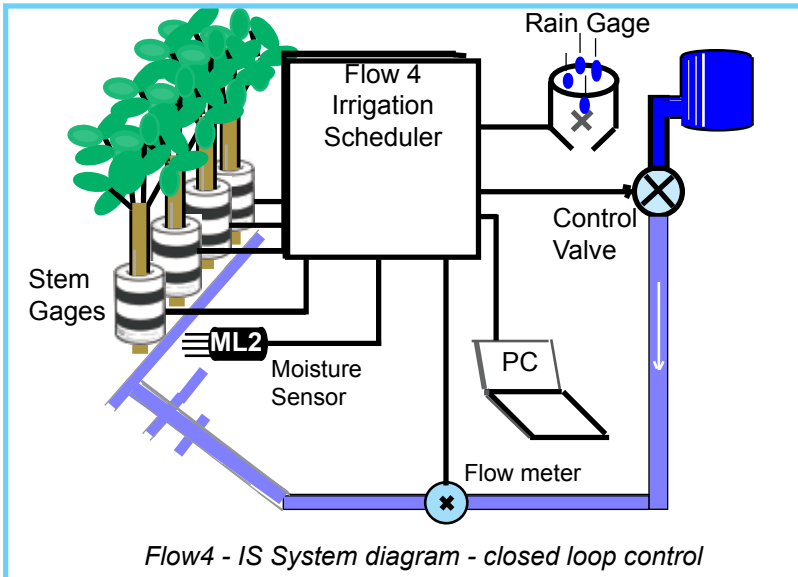
## Setup and Control Software

Software to install and configure your Flow4 system is as easy as pointing and clicking on the icon for that function. Each plant-sensor has automatic diagnostics, with check marks to indicate all is well. Software "setup" and the menu choices are clearly indicated graphically.

After setup is complete, the PC may be disconnected and Flow4 does the rest. By direct communication to Flow4 in greenhouses and with remote radio MODEM, PC software displays plant sap flow rates, rain, total irrigation, and the water balance on graphs as well as bar charts. Separate menus adjust the crop-field description, logger settings, and show overall system status. No other system has these unique features.



# Flow4™ Sap Flow Logger-Irrigation Control



## Specifications

### Datalogger

Proprietary embedded microprocessor at 8 Mhz clock, Non-volatile memory for data logger. 14 days of hourly logs storing raw data and sapflow data. History data stored in 4 kb non-volatile memory. 14 days of hourly sap flow data. 100 days of irrigation and water use history.

### Sensor Inputs

#### Dynagage sap flow sensors (4)

12 differential inputs: range +/- 2.5 mV, 0.1 uV res. 4 inputs: range 0-10 V, 1.0 mV res.

**Auxiliary sensor** range 0-2.5V, 0.1mV res.

**Rain gage** dry contact closure.

**Flow meter** dry contact or solid state 0-12 V. 7 KHz maximum pulse rate. All inputs are over-voltage and lightning surge protected.

#### Valve Control Output (Flow4-IS only)

Valve control relay, 15 A @28 Vac maximum.

### Sensor Cables

Four each, 8 conductor, 25 ft (7.6 m) to Dynagage. All external inputs are provided with quick connect terminals.

### Communications

RS-232, 9600 Baud, 15 ft. (5m) cable 9-pin serial.

## Optional Communications

**USB Compatible** Flow4 is compatible with PCs with USB connector using Dynamax supplied USB adapter.

**RF Modems** 900 MHz/ 2.4GHz, up to 40 miles (LOS), point-to-point, point-to-multi-point configurations and repeater option. **Short-haul Modems** Up to 1.3 miles Point-to-Point, Point-to-multi-point configuration. DIP switch selectable.

#### Power: AC Outlet Adapter

Switching regulator, 3.6 A @15 V dc; 120/240 Vac, 50-60 Hz., 6 ft power cable (1.8 m).

#### Battery Power - Voltage Requirements

Sealed lead-acid, 12 V, 5 Ah. Working range 10-15 V. Absolute minimum - 6 V. to keep microprocessor ON. Fail-safe indicator.

#### System Current

50 mA without sensors maximum fuse current 3.15 A, 250V, (5x20 mm).

#### Enclosure Dimensions

6.5" x 11.75" X 13.5" (16.5 x 30 x 34.3 cm)

**Weight:** 15 lb (7 kg)

**Ratings:** NEMA 1, 2, 3 rain tight. CSA, UL listed.



# Flow4™ Sap Flow Logger-Irrigation Control



Flow4-IS setup in a vineyard, powered by solar panel and external battery

## Optional Communications

### USB Adapter:

Flow4 can be used with Desktop/ Notebook PCs having a USB port only, by using USB adapter. Adapter cable is supplied with software/ drivers in Flow4 CD.

### Short-haul Modem (SHM):

In situations where it is feasible to run a cable from PC/ workstation to the Flow4 but is limited in distance due to the loss in 9-wire data cable, Short-haul modem is provides an alternative. Using short-haul modem and 4-wire cable (or a commercial telephone wire with end connectors) range can be increase up to 2 Miles. Limitation of this is to run cable that long.

### RF (Radio) Communication (RFMX):

For remote applications or long-distance communication where installing a cable is impossible RF (Radio) modem is ideal. Using Dynamax's RFX modems distance of communication between PC and Flow4 can be increased up to 40 Miles (Line of sight). RFX-MK is a complete modem kit offered by Dynamax includes RFX modem all the accessories, antenna and lightning protector assembled in a weather proof enclosure.

## Ordering Information Communications

**DNX9600** - 9600 Baud MODEM

**SHM115**-Short-haul RS-232 modem 2miles@9600 bps

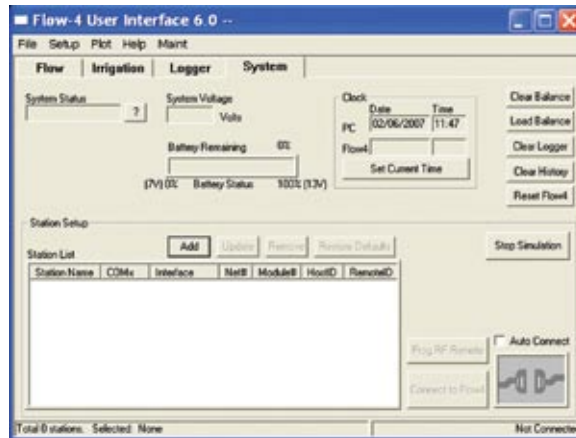
**RFX09-MK, RFX24-MK** - 900 MHz/ 2.4 GHz RF modem kit. 20 miles (LOS). Includes, 11dB High-gain antenna, Surge Protector, 15' coaxial cable, 5 Ahr battery, RS-232 cable 6' long, Assembled in a weather-proof enclosure, mount kit.

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## Software Features

- System status indicating normal, fail-safe, data collection etc.
- Battery status indicating voltage and percent battery remaining
- Flow4 time and PC time and button to change system time
- Station list, Communication interface, all files related to each station can be saved in directory generated by Flow4 with name of the station, allows better organization of system settings and DATA files for user.
- Communication status and command to Simulate hardware for demonstration purposes.
- Quick and easy to setup software interface features to add and remove communication devices such as RF (Radio) modem, Short-haul modem, COM port etc.
- Sessions/Debug file saves all the communication between software/PC and the logger in a text file for review by the user if necessary.
- Total records stored in data logger
- Individual file names for data logger, hourly history, daily usage history. Append or over write to file.
- Automatic data retrieval schedule, given start date, time and interval to collect data and save to files.

