SoilGas-CM Soil diffuse flux continuous monitoring unit

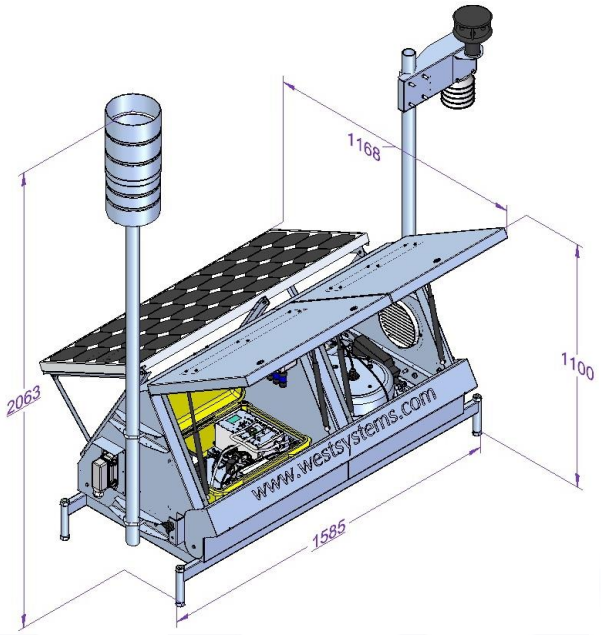
SoilGas-CM, now available as release HWR10, is able to measure:

a) **Carbon dioxide diffuse soil flux by applying the accumulation chamber method.**
b) **Hydrogen sulfide soil flux by applying the accumulation chamber method.**
c) Air temperature
d) Soil temperature
e) Soil water content
f) Wind speed and direction
g) Air Relative humidity
h) Barometric pressure
i) Gas flow in the sampling line
j) Rainfall

The SoilGas-CM unit is a completely automatic station, power supplied by a solar cell and backup battery, which performs the measurement cycles with a configurable frequency (by default every hour).

DWH-SFS IP 42 AISI316 enclosure for the soil flux station, support for telemetry system, meteorological sensors and solar cells power supply system.
The shelter is divided into two sections to contain:

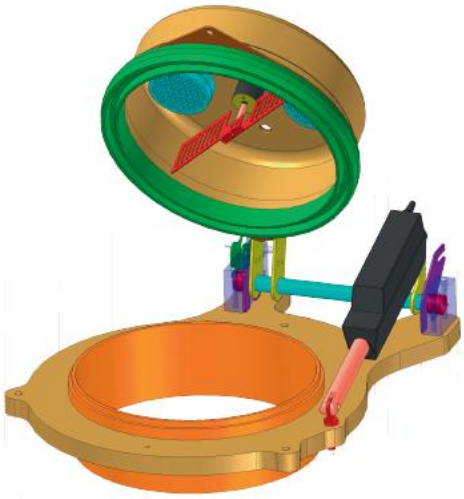
- Accumulation chamber
- Control unit and battery



SCPS-MP+BATT-MP **Solar panels power supply system**
96 hours autonomy without direct solar radiation.
The station is supplied by one solar cell (85 W peak power) and by 55 A/h battery @ 12 V
During the night and in periods of low solar radiation power is supplied by the battery. To avoid battery damage, a dedicated circuit turns off the station when the power is low.

- Lightening protection with solid state devices.
- Charge regulator
- Solar panel mount kit: inclination selectable on-site from 15° to 60° for optimal exposure to sun rays at the installation site latitude

ACE_IV **Accumulation chamber**
Automatic aluminum accumulation chamber with internal mixing device;
Motor for the motion of the accumulation chamber;
2 Proximity sensors (Chamber open/Chamber closed)
Connection cables and pipes chamber-to-station.
Chamber surface: 700 cm^2
Chamber weight: 16.5 Kg



SoilGas-DL: a specialized data logger that controls the functioning of the station and the communications with the remote center. The DL stores the data into a removable SD memory (2 GB storage capacity).

Display: the station is equipped with a LCD monochromatic display and a 6 buttons keyboard

The SoilGas-DL is equipped with:

- Analog to digital conversion board with 8 analog inputs (4 inside the case, 4 on the external panel). 3 of the 4 internal inputs are used for the carbon dioxide detector, AWM330 flowmeter, barometric pressure gauge). The remaining 5 channels can be used for additional sensors (with 0-5 Volts or 4-20 mA interface).
  Signal conditioning circuit
  Resolution 24 bit
  Accuracy 16 Bit

- Bus RS485 that allows the management of airbox, soilbox and up to 32 high resolution (24 Bit / 16 bit accuracy) additional input devices for thermocouples, heat flux sensors, differential pressure gauge, PT100 temperature probe, and voltage signals.

- Flowmeter**:** AWM3300
  This sensor measures the quantity of gas mixture that is pumped into the measurement line. It is used to assess the pump and filters status.

- Barometric pressure sensor: Vaisala Barocap PTB110
  Temperature compensation.
  Measurements range 600-1100 hPa
  Linearity and hysteresis: ±0.3 hPa

- Accessories
  Pump, fittings, tubes, connection cables.
  Plastic anti-corrosion IP 67 Case with AISI316 accessories.

Power requirements:
Less than 12 mA @ 12 Volts in standby

Average 100 mA @ 12 Volts with telemetry ON (10 minutes per hour)
1200 mA @ 12 Volts during the analysis (3-6 minutes per hour)

GMP343 **Carbon dioxide flux measurement**
The detector is based on a silicon-based non-dispersive infrared (NDIR) sensor
Concentration measurement range: 0-2%
Accuracy: ± (5 ppm + 2 % of reading)
Pressure compensation in the range 700-1300 mBar

WSonic **Wind speed and direction measurement**
Measurements range 0 to 60 m/sec, direction 0 to 360°
Tolerance 1%
Resolution 0.01 m/sec.
Linearity 0.5%
Technology: Sonic 2D sensor
Temperature limits 0 to 65°C (ice or snow can stop the measurement/ NOT damage the sensor)
Requires the AirBox interface

AirBox Hardware interface for the management of one Windsonic gauge, one RainGauge and one DRHT_G air temperature and relative humidity gauge. It has a RS485 interface managed by the proprietary WS-EX protocol.

DRHT_G **Air Temperature and Relative humidity sensor**
Thermohygrometer with double antiradiation protection.
Relative humidity: 10 to 98% Solid state digital sensor. Tolerance ±3%
Temperature: -30 to 70° C accuracy: 0.4°C at 20°C
Requires the Air.Box interface

Pt100_PTFE **Soil temperature sensor:**
Temperature Pt100 probe 0 ~ 200 °C
Accuracy ± 0.1°C
Body AISI 316
Cable PTFE
Requires the Soil.Box interface

WSCS616 **Soil water content**
Type: Time Domain reflectometry sensor.
Range 5- 50% (Volume of water / Volume of Soil)%
Tolerance 1%
Linearity 0.5%
Temperature limits 0~ 65°C
Requires the Soil.Box interface

SoilBox
Hardware interface for the management of one PT100_PTFE probe and of one CS616TDR water content probe. The SoilBox has a RS485 interface managed by the proprietary WS-EX protocol.

RAINGAUGE **Rainfall measurement**
Resolution: 0.2 mm
Collector surface area: 324 cm^2
Measurement range: 0-10 mm/min
Requires the AirBox interface

Telemetry system
For remote control and download of data. The optimal telemetry system for the installation site must be evaluated basing on several parameters: distance (and presence of obstacles) between station and master centre, GSM-GPRS-3G signal strength at the station, service costs. The following solution is proposed:

T_SS24 **Spread spectrum radio system**
The telemetry is based on Spread Spectrum radio-modem operating at 2.4 GHZ (License free in most countries) or 900 MHz (License free in USA) or 869 MHz (ETSI approved for Europe, license free), the range is up to 40 Km. To operate correctly is necessary that the station site and the master center site are optically IN LINE OF SIGHT, no obstacles are allowed. It's possible to add one or more repeaters to reach the connection. It includes a slave radio (flux station side) and a master radio (PC side) with 14db backfire directional antennas (2.4 GHz) or YAGI 6 element for 869 and 900 MHz.

(NOT FURNISHED) Personal computer of the receiving centre
Minimum requirements:
CPU: 1 GHz or faster
2 Gb RAM
80 Gb HD
1 LAN Ethernet
MS Windows 7 or 8 operating system English Release (Advised)
MS Windows VISTA Pro operating system English Release (Not advised)
Other operating systems are NOT supported by our application.
Open office or MS office are needed for data management.

Note: because maintenance reasons we suggest to purchase the remote center personal computer directly in your country, following minimum requirements indicated above.

WS-SCADA **Data receiving and processing software**
The WEST Systems software suite executes polling of the Station, data transmission, processing and storage in a MYSQL, PostgreSQL, Microsoft SQL Server or MS Access format database, graphic visualization of the stored data and report generation in Excel compatible format.