PLANT PHYSIOLOGICAL RESEARCH

You will return to the contents of P4 EARTH MONITORING by clicking the pictogram

Plant physiological research comprises a study of all kinds of processes taking place in growing plants or their environment. For this type of research we provide a number of field and laboratory instruments, for example, for surface measurements of plant leaves, water potential measurements, and water or CO_2 evaporation measurements, allowing to analize the behaviour of diseased plant leaves at special conditions.

19.01 Leaf colour charts

Colour charts express colours of leaves in objective and numerical terms by means of comparison with a large number of standard colour chips (according to Munsell).

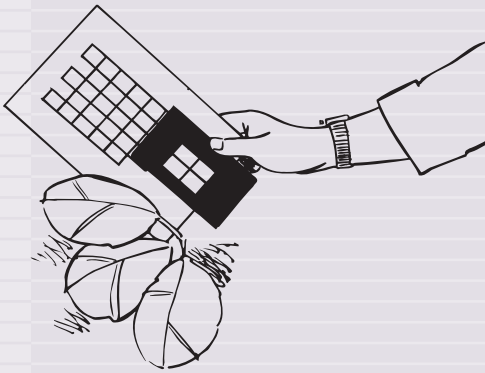
19.04 Automatic porometer

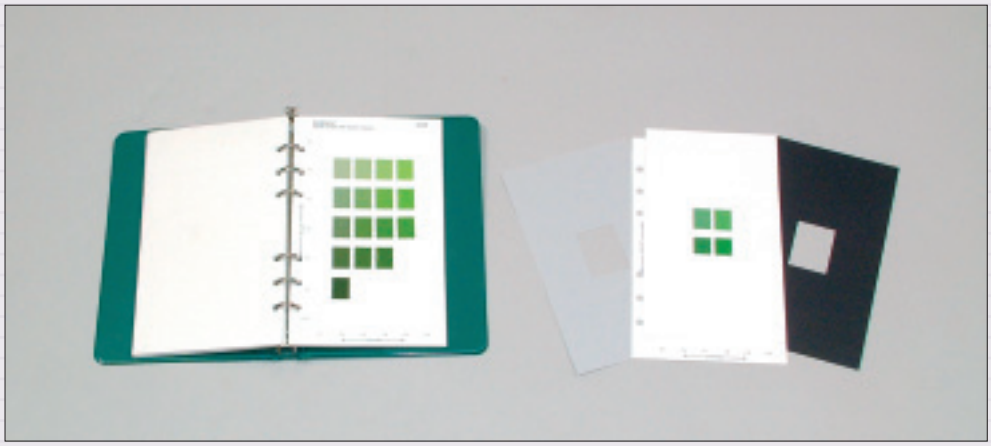
The loss of water (evaporation) by plant leaves is regulated by the stomata (pores) of the leaves, as CO_2 absorption is necessary for photosynthesis. It is an important indicator for the physiological condition of the plants. The opening of the stomata can be interpreted as the resistance against gas diffusion (in s/cm) and is measured using the porometer. The porometer is fitted with an automated, fast measuring cycle which yields temperature compensated measuring results. Since the stomata are sensitive to the presence of the porometers sensor head, measurements are executed within less than 15 seconds. The instrument has a measuring range of 0 - 30 s/cm and is suitable for wide and narrow leaves. The instrument has an internal memory for approximately 1500 measurements, including notes. Data can be transmitted via an RS232 interface to a printer or PC. The instrument is provided with a clearly readable display and function keys.

In preparation of a series of measurements, the porometer can be calibrated fast and easy by using software and a calibration plate.

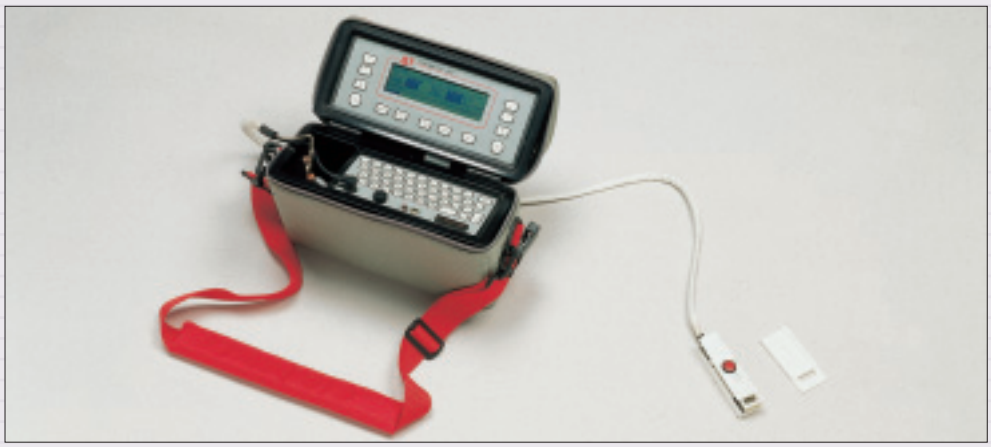
The porometer is supplied including sensor head, calibration plate, RS232 cable, software, charging apparatus and carrying bag.

The leaf colour is determined with the leaf colour chart.



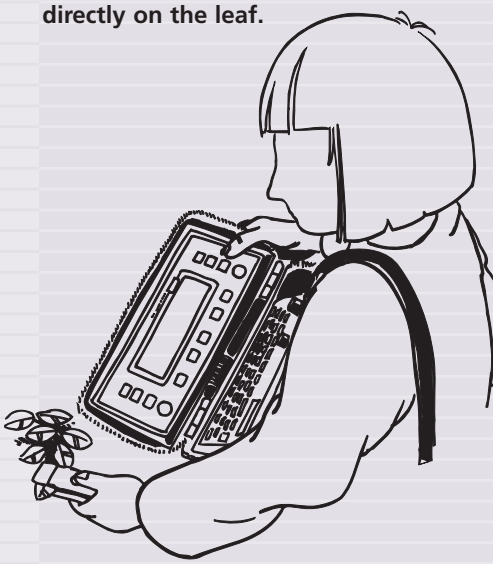


Leaf colour chart



Automatic porometer

Using the porometer the measurement of the resistance against gas diffusion is executed directly on the leaf.



Eijkelkamp Agrisearch Equipment

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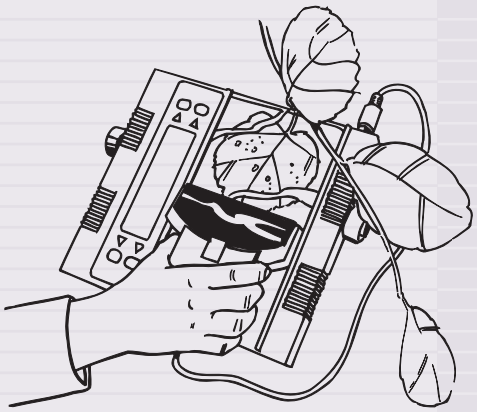
PLANT PHYSIOLOGICAL RESEARCH

A diseased leaf is researched in the field using the portable leaf area meter.



19.13 Portable leaf area meter for diseased leaves

The portable compact leaf area meter is suitable for non-destructive measurement of leaf surfaces that are affected by diseases. The measurements are done by means of user friendly, menu driven software.

The meter consists of a high resolution scanner and a scan board with integrated data processing and storage. The instrument is provided with a large graphical display, allowing direct read out of the measured parameters of the scanned leaf. The measurements can be shown in mm, cm or inches, and are stored together with leaf images. The leaf area meter has a memory size for approximately 2000 measurements. The data can be transmitted via an RS232 interface to a printer or PC. The meter is supplied including battery charger, scan board, software and RS232 cable.

19.15 Laboratory plantwater status console

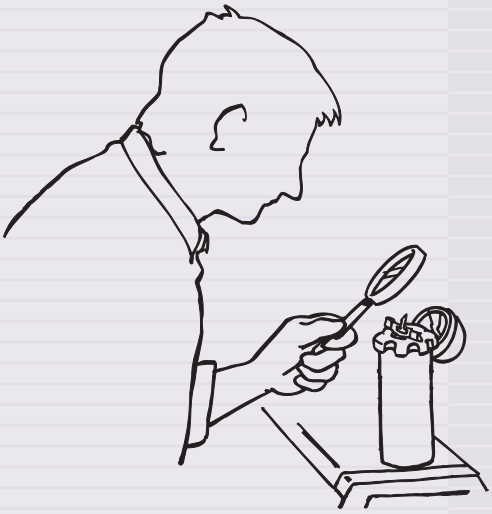
An analog system to determine the water potential in plant sections, up to 40 Bar. The instrument is supplied with an adjustable pressure source, pressure vessel, standard sample holder, accessories and manometer.

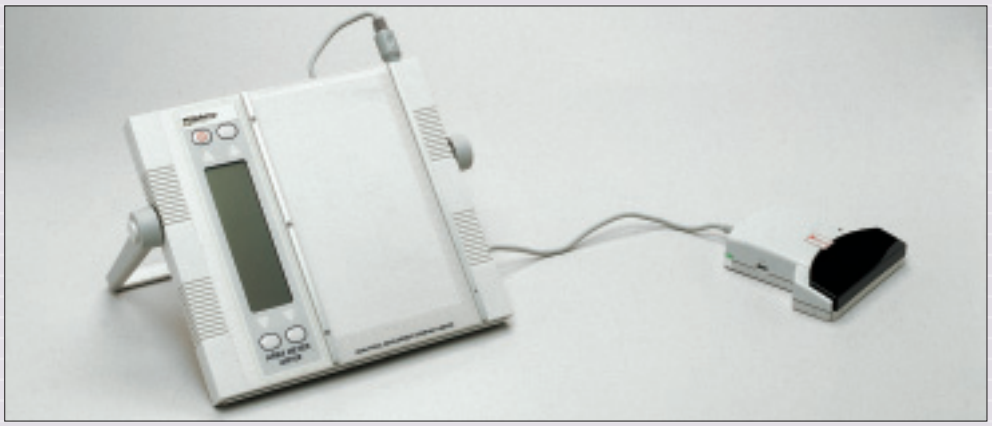
The meter operates in accordance with the pressure bomb method of Scholander. Following this technique a leaf or small branch is cut off and is being exposed to atmospheric pressure in the sample holder. Subsequently, the pressure in the pressurization vessel is being increased, until the moment the plant moisture is pushed through the stem cut. This equilibrium pressure is an indicator for the negative pressure of the water in the plant system at the moment the sample was cut off. Unusual moisture tensions (as a result of water shortages) imply deterioration of plant growth and the resulting yield. The system is suitable for branches and leaves with a stem cross section of at most 6 mm.

19.20 Field plantwater status console

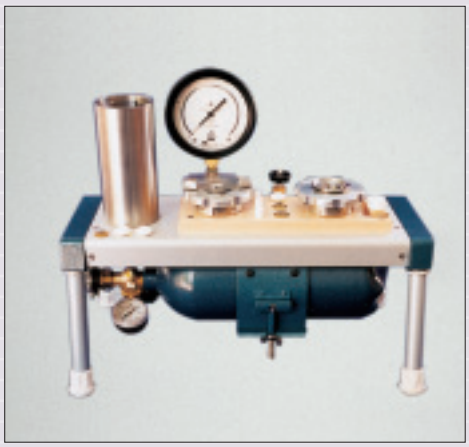
The field plantwater status console can be used for observations in the field, allowing plant observations in accordance with the same working principles as the laboratory apparatus. The chamber pressure can be read out by a dial gauge. The gauge has a maximum pressure needle which can be used to 'freeze' the reading.

The sample is checked for sap discharge.





Portable leaf area meter



Laboratory plantwater status console

Field plantwater status console

19.72 LCi Ultra compact photosynthesis measurement system

A portable microprocessor controlled system for CO_2 and water vapour exchange measurements. The system is equiped with newly developed miniaturised infrared gas analysis (IRGA) sensors, housed in a conditioned leaf chamber.

The leaf chamber allows very accurate and reliable CO_2 and water vapour measurements for various types of plants. The leaf chamber CO_2 and water vapour concentrations are automatically controlled by the system, operating either in a controllable flow through mode, or in an open system mode.

The necessity for a large external volume is removed by a new buffer application, which counteracts fluctuations in ambient $C0_2$ concentrations. All $C0_2$ measurements are also automatically compensated for atmospheric pressure and temperature. The leaf chamber is provided with sensors for measurement of temperature and photo-synthetic active radiation (PAR) as well.

The instrument is operated by a control console, equiped with a number of keys, a large liquid crystal display (LCD) screen, and a series of easy to use menus, which allow the user to access a wide variety of parameters, such as CO_2 and water vapour, chamber and leaf temperatures, PAR, Battery status, and many more. An exchangable PC (PCMCIA) card is being provided, capable of storing a large number of measurements.

Finally, measurements can be initiated either by the control consol or by a remote button located on the leaf chamber.

The recorded data is accessable either by down-loading via an RS232 interface, or by transfer directly from the PCMCIA to a computer.

The data format is compatible with general spreadsheet applications.

The instrument is supplied including an exchangable broad model leaf chamber, carrying bag, air probe, battery charger, spares kit and required chemicals.

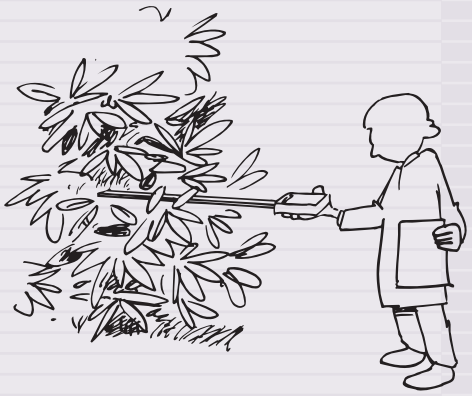
Additional narrow and conifer model leaf chambers are also available.

The determination of CO_2 and water vapour exchange with the LCi.

Portable system for CO_2 and transpiration measurements

SOLAR RADIATION MEASUREMENTS

The light interception probe is used to determine the leaf area index.



The PAR sensor is used for above canopy reference measurements together with the light interception probe.

Photosynthetic processes in plants are much dependent on solar radiation. For measuring solar radiation properties, a SunScan light interception measurement system is available.

19.14 Light interception measurement system, type SunScan

A direct relation exists between the quantity of incoming radiation absorbed (intercepted) and plant biomass created. Therefore, data concerning the photosynthetic active radiation (PAR) are of great importance in order to obtain the ideal light conditions for maximum yield.

The SunScan system meets the need for this data and is suited for measurement and analysis of the PAR in the canopy of crop.

The SunScan package consists of a light interception probe, data collection module and software.

The probe, having a 1 meter length, contains 64 PAR sensors which are read-out every single measurement. The probe has a measuring range of 0 to >> 2500 µmol-2s-1 and a resolution of 0.3 µmol-2s-1. The probe is to be connected to the data collection module via an RS232 interface. The control button on the grip of the probe allows fast and accurate measurements. By means of the data collection unit the probe is programmed for automatic measurements with time intervals in a range of 1 second to 24 hours.

The data module reads and calculates the average light level from every individual sensor provided, where every individual sensor value remains available in memory, allowing an additional, more detailed study of the PAR.

Raw readings and derived functions such as light transmission and leaf area index (LAI = variation in light perforation by crop/canopy) can be shown, collected and stored.

Groups of readings can be averaged, while different display and storage formats can be chosen. The data collection module is a light weight handheld computer for storage and analysis

Light interception probe with data collection unit and PAR sensor on tripod.

SOLAR RADIATION MEASUREMENTS

of the measuring data produced by the probe.
Data are stored on exchangable flashcards. The supplied memory size provides a capacity for storage of about 2000 readings. For any further storage needs, additional flashcards are available. Finally, the collected data can be transferred to a computer or directly to a printer for further analysis.

As an alternative to the use of the data collection terminal, it is possible to connect a laptop computer to the RS232 interface of the interception probe and to run and use the supplied SunData software for programming, readout and data analysis, as the SunScan software provides all functions and options of the data collection module. However, the use of a data collection module is recommended, as the use of a laptop computer in the field will prove to be unpractical, due to its battery life time and weight.

The SunScan is supplied including interception probe, data collection module, and software. The datacollection module is provided with a 256 kb flashcard.

Also available is an external PAR sensor for measurement of PAR above the canopy and direct and difuse light. Maximum reading 2500 µmol-2s-1 .
The sensor uses an aray of photodiodes and a unique shading pattern to calculate whether the sun is shining and to measure the direct and diffuse components of solar radiation.
This completely avoids the need for troublesome shade ring adjustments required with conventional diffuse light sensors.
The sensor can be mounted on a special telescopic tripod.

Light interception probe

Data collection module

External PAR sensor

Cat.no.	Art.no.	Description	Qty. in set
Plant physiological research (P4.50)			
		For plant physiological research we supply different instruments:	
19.01.02		**Leaf colour charts, 320 colour chips, arranged on 17 charts (2.5R, 2.5YR, 2.5Y, 5GY, 5G, 2.5B, 5R, 5YR, 5Y, 7.5GY, 7.5G, 5RP, 10R, 7.5YR, 2.5GY, 2.5G, 5BG), according to Munsell**	
19.04		**Automatic porometer, measuring range 0-30 s/cm, incl. sensor head (area 2.5x22.5 mm), calibration plate, recharge-able battery, RS232 cable, drying agent, battery charger 220V-50Hz and carrying case (excl. software)**	
		Required accessories for porometers:	
19.04.06		CD-rom with software for poro-meter to process measurements with an IBM compatible PC. The software is suitable for computers with Windows 95/98/2000	
19.13		**Portable leaf area meter for diseased leafs, with large graphical display for display of the scanned leaf, download to PC possible, memory for approx. 2000 measurements, high resolution, easy to use, incl. battery charger, scan-board, RS 232 cable and manual**	
19.15		**Laboratory plantwater status console, compl. with regulated pressure source, pressure vessel, general purpose sample-holder with accessoires (sealing sleeves, support washers and manometer 0-40 bar**	
19.20		**Field plant water status console. Complete set with portable gas tank and general purpose sample holder with accessories (sealing sleeves, grommet and support washers). Supplied with manometer 0-40 bar.**	
		Optional accessories for field plantwater status console.	
19.20.05		Accessory kit for field plant water status console consisting of volume filler (102 mm), lighted hand loop, sample bags, easy carry gas tank handle and set of grommet insertion tools.	

Cat.no.	Art.no.	Description	Qty. in set
19.72		**LCi, ultra-compact photosyn-thesis measurement system. Complete set comprising: control console with interchangeable broad model leaf chamber head, air probe, battery charger, basic spares kit and instruction manual.**	
		Optional accessories for Lci:	
19.72.02		Interchangeable narrow model leaf chamber head for Lci system	
19.72.04		Interchangeable conifer model leaf chamber head for Lci system	
Solar radiation measurements (P4.60)			
19.14		**Light interception measurement system, type SunScan. For measurement of photosynthetic active radiation (PAR) in plant canopies. Complete standard system with light interception probe, data collection module and software**	
**19.14.01		Light interception probe, type SunScan. Length 100 cm, 13 mm wide, with 64 PAR sensors. Measuring range 400-700 nm (PAR). Maximum reading 2500 micromol/m-2/s-1. Power supply alkaline batteries	1
**19.14.03		Data collection module for light interception probe type SunScan. Data storage on so called flashcards. With digital display for direct reading in the field. Auto-log function. Incl. RS232 cable to transfer data to a PC or printer. Power supply: batteries	1
**19.14.06		CD-rom with software for light interception measurement system type SunScan	1
		Accessories:	
19.14.08		External PAR sensor for light interception measurement system type SunScan. Measurement of PAR above the canopy and direct and diffuse light. Max.reading 2500 µmol/m-2/s-1. Sensor is connected to the light interception probe. Excl. cable.	
19.14.09		Telescopic tripod for mounting of external PAR sensor in the field. Max. height 1.73 m	