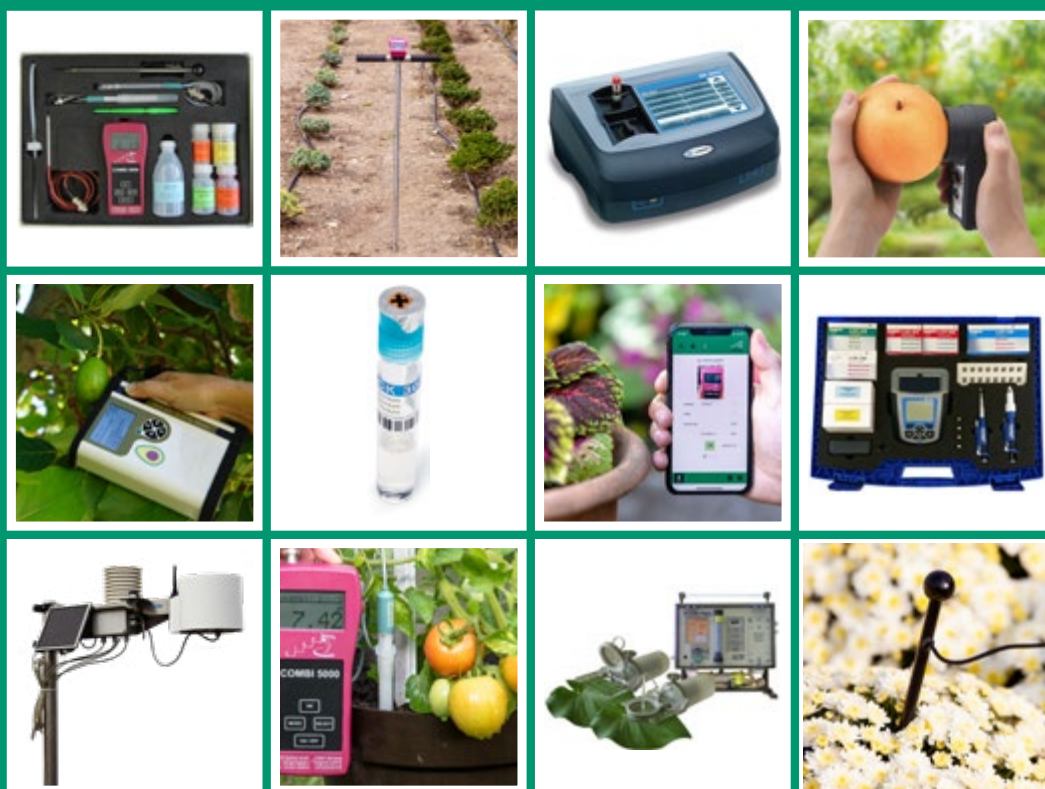# STEP Systems GmbH

Soil Testing Equipment - Professional Systems

Soil - Water - Climate
Testing Equipment

Catalogue

www.stepsystems.de

Online Catalogue

STEP Systems GmbH
Duisburger Str. 44
90451 Nuremberg
Germany

Phone: +49 911-96 26 05 0
Fax: +49 911-96 26 05 9
e-mail: info@stepsystems.de
web: www.stepsystems.de

Business hours:
Mo. - Thu. 8 a.m. to 5 p.m.
        Fr.   8 a.m. to 1 p.m.

VAT-no.: DE 813853567
Tax-no.: 216/137/80065
Register court: Fürth HRB 9582
CEO: Harald Braungardt

Member of **IVG** INDUSTRIEVERBAND GARTEN E. V.

Contacts:

Harald Braungardt
CEO
e-mail: hb@stepsystems.de
Languages: German / English / French

Marjan Karlovic
Sales and Technical Manager
e-mail: mk@stepsystems.de
Languages: German / English / Croatian

Anastasia Konarek
Sales and Export Manager
e-mail: ak@stepsystems.de
Languages: German / English / Russian

Yana Murashova
M.A. Strategic Marketing Management
e-mail: ym@stepsystems.de
Languages: German / English / Russian

Lovren Brajkovic
Production Manager
e-mail: lb@stepsystems.de
Languages: German / English / Croatian

Carolin Bauriedel
Office Manager
e-mail: cb@stepsystems.de
Languages: German / English

8 measurements with only 1 device

COMBI 5000

The new generation of plant nutrition measurement technology

Air temperature, humidity and air pressure measurement

NEW

The HPT probe enables simultaneous measurement of air temperature, humidity and air pressure. The integrated sensor technology is highly precise and has a very fast response time. Like all COMBI 5000 sensors, the air temperature and humidity sensor is automatically recognised by a special coding as soon as it is connected to the basic unit.

The HPT sensor is especially important in greenhouse cultivation with ventilation and shading installations. The extension of the control possibilities of the growing conditions by measuring air temperature and humidity is a further step in the development of a fully comprehensive multifunctional control system in professional plant production.

The COMBI 5000 is an universal instrument for the immediate measurement of the most important parameters in plant production.

Universally applicable

Wide range of probes for monitoring nutritional status of your plants.

No application errors

The latest microprocessor technology enables automatic sensor recognition: each time the probe is changed, the instrument automatically switches to the corresponding measuring mode.

Easy-to-use

The automatic buffer recognition during calibration also ensures a high level of operating convenience and additional safety.

Fast on

Simply exchange probes during the measurement without a re-start.

Saves time

Simultaneous measurement of different parameters.

Always ready to go

The unit is delivered in a sturdy aluminium case, with all accessories stored safely and within reach.

Multilingual

Easy to understand menu is available in three languages: German, English and Russian.

Smart

Evaluation via the COMBI 5000 app provides quick and easy storage and interpretation of all measured values for different plants.

Functions:

pH measurement

pH is one of the most important parameters in the plant nutrition. The absorption of nutrients by the plants is highly dependent on pH. For this reason, fast, easy and accurate pH measurements are essential in professional horticulture.

EC measurement

Electrical conductivity of an aqueous solution is directly related to the concentration of the dissolved salts. For plant nutrition control, it is essential to measure EC of process water and nutrient solution, especially in closed and hydroponic cultivation.

Activity measurement (salinity)

Salinity is determined by the concentration of total dissolved salts directly in the soil or substrate, taking into consideration the relevant soil properties, like soil moisture, temperature and soil compaction. These factors determine the quantity of salts being "active" and available to the plants.

Moisture measurement

The measuring principle is based on the FDR measuring technology and is not affected by pH and salt content of the soil and substrates. Water content data (expressed in Vol%) allow immediate statement about the irrigation water requirements.

Soil temperature measurement

Temperature measurement is carried out in the range of -10°C to +50°C by a fast-reacting NTC sensor spattered in the probe tip.

Data logger function

NEW

The basic unit can be ordered with an integrated data logger, which records all measurements. Using the USB cable, all data stored in the device can be transferred to a computer.

Technical data, component parts and configurations see pages 10-11.

Video Overview

8 measurements for rapid control of plant nutrition with only one device.

With the COMBI 5000 in the hand, you have the most important parameters such as pH value, EC value, activity, moisture, temperature, humidity and air pressure, to determine the nutritional status of your plant stock professionally and quickly.

All measurements can be carried out both in the (nutrient) solution and/or soil suspension but also directly in the soil or substrate. This way, the plant producer can detect a deficiency or surplus of nutrients at an early stage and react in a targeted manner to ensure the good development of the crop.

Probes and features:

- **pH probe**
  direct measurement in soils, substrates and liquids
- **EC probe**
  conductivity measurement in liquids, e.g. nutrient and stock solutions
- **Multi-probe**
  for simultaneous measurement of:
  - activity measurement (salinity),
  - soil moisture (volumetric)
  - soil temperature
- **HPT probe**
  for simultaneous measurement of:
  - humidity
  - air temperature
  - air pressure
- **Data logger function**
  with data export option

The COMBI 5000 works with automatic sensor recognition and automatically changes to the appropriate measuring mode each time the electrode is being changed. This makes working with the instrument much more intuitive and virtually eliminates application errors due to incorrect menu settings.

The automatic calibration of the COMBI 5000 offers a further safety feature: The instrument automatically recognizes all required pH and conductivity standard solutions and adjusts itself automatically to the specified value.

The COMBI 5000 is a perfect tool to provide information about the plant nutrition status for professional plant producers and consultants all over the world due to the multi-lingual menu navigation (DE, EN, RU). The COMBI 5000 takes the predicate "Made in Germany" and the associated high quality standards into account in every way.

Recommended applications:

- Nurseries: container plants, particularly if slow-release fertilizers are applied
- Landscape: golf course greens, sports grounds, etc.
- Peat production for immediate check during production process
- Compost plants: to avoid excess of salt concentration in compost soils
- Communities, local governments: determination of soils charged with chloride after winter period
- Consultants, advisors, salesmen, etc.
- Universities, schools, horti- and agricultural educational institutes
- Pot plant production: control of nutrient solutions (fertilizer mixing systems), stock solutions
- Substrate production: salinity control of peat and cocopeat products
- Hydroponic systems, growing media like rockwool, etc.
- Laboratory use as universal pH and EC-meter

Customer review on us:
Video from Bioland Kräuter Gut Dworschak-Fleischmann, Nuremberg, Germany

COMBI 5000 App
Artificial intelligence in horticulture

With the COMBI 5000 App you can easily digitize all COMBI 5000 measured values.

The evaluation via app guarantees quick and easy storage and interpretation of all measured values for different cultures.

Simply make a photo of the display with measured value and the app automatically recognises the values and the parameters measured: pH and / or salinity, EC or soil moisture. After the crop and the measurement location are selected, the app immediately provides an interpretation of the respective measuring results.

Afterwards, all measured values of a plant can be displayed chronologically in comparison to the STEP Systems reference values. All measured values including the interpretation can be exported as a clear PDF document. In this way, all measurements with crop, measuring location and time tag can be documented properly.

Since the pH probe should be calibrated regularly, COMBI 5000 App counts for you how many pH measurements have been made since the last calibration. After 20 measurements COMBI 5000 App will remind you to perform the calibration and shows you step by step how to do it.

pH measurement directly in soils / substrates and liquids

pH 5000

pH 5000 meets all requirements for the application of soil- and/or water pH measurements in an outstanding way. It is particularly designed for direct pH measurements in soils and other growing media. The rugged field-ready housing is well-protected against dust, moisture and air humidity. The gel-filled insertion probe is developed especially for soil analyses. Therefore it can measure pH both directly in soil and in liquids.

pH 5000 is provided with automatic calibration. According to 2-point-calibration, clean and dry electrode should be inserted into the pH 7 solution first. The pH meter recognizes each buffer solution automatically. After the value on the display is stabilized, the electrode should be dried up and inserted into the pH 4 solution. The integrated stability indicator signalizes termination of the calibration procedure. Even a 3-point calibration with additional buffer pH 10 could be carried out if necessary.

Delivery contents: COMBI pH 5000 basic unit, pH insertion probe, buffer solutions pH 4 and pH 7 (100 ml each), storage solution for the probe (3 mol KCL, 50 ml), prick lance, manual with optimal values, transport and storage case.

Technical data	
Housing	splash-proof, rugged
Dimensions	180 x 83 x 55 mm
Power	9 Volt battery, > 4000 measurements
Connector	BNC plug
Weight	300 g
pH measurement	
Measuring range	0-14 pH
Resolution	0.01 pH
Accuracy	± 0.02 pH of measured value
Calibration	automatic, at pH 4 and pH 7. Additionally at pH 10 if required.
Probe	specially-designed insertion glass probe with 3 ceramic diaphragms
Probe length	125 mm
Application	pH measurement: - direct in soils and substrates - in liquids, e.g. irrigation water, nutrient solutions.

Item-no.	
10390	pH 5000, complete case
Components	
10391	pH 5000, basic unit
10302	Insertion pH probe
31001	Buffer solution pH 4, 100 ml
31002	Buffer solution pH 7, 100 ml
31006	Electrode storage solution 3 mol KCl, 50 ml
90020	Prick lance

pH Measurement in Solutions

pH Test Indication Papers

pH indicator test strips for easy and fast pH test of solutions. Different indicator fields on each test strip colourize differently according to the pH-value of the medium. The measured pH is read off by comparison with a supplied colour shade. Packages at 100 pcs/pck. are available in three different types:

• Measuring range: pH 0 - 14, resolution 1 pH
• Measuring range pH 2 -9, resolution 0.5 pH
• Measuring range pH 4 - 7, resolution 0.3 pH

Item-no.	
30031	pH test indication paper pH 0 -14, 100 pcs.
30032	pH test indication paper pH 2 - 9, 100 pcs.
30033	pH test indication paper pH 4 - 7, 100 pcs.

ECO pH Pocket Tester

The waterproof pH tester has a dual-level LCD that displays pH and °C. This pH meter has a temperature probe for fast and precise temperature measurement and auto-compensation.

• Stability indicator
• HOLD-function
• Automatic switch-off: after 8 min

Delivery contents: ECO pH tester, buffer solution pH 4 and pH 7 (50 ml each), manual.

Technical data	
Housing	waterproof
Power	4 x 1.5 V > 350 h
Measuring range	0 - 14 pH; 0 - 60°C
Resolution	0.1 pH; 0.1°C
Accuracy	± 0.1 pH / ± 0.5°C
Calibration	automatic 2-point calibration
Probe	replaceable

Item-no.	
23065	ECO pH pocket tester
23066	pH probe
31018	Buffer solution 50 ml, pH 4
31019	Buffer solution 50 ml, pH 7

pH measurement in soil

pH Soil Tester

solid plastic case

Sturdy field tester for direct measurement in the field, with moisture control.

Application: agricultural and horticultural fields, park areas, sports grounds, private gardens.

No battery required.

Not for use in composts, peat substrates or solutions. Not suitable for determination of soil moisture.

Technical data	
Measuring range	3 - 8 pH
Accuracy	± 0.2 - 0.4 pH
Length	basic unit: 17 cm, probe: 6.5 cm

Item-no.	
30010	pH Soil Tester

Salinity is determined by the concentration of total dissolved salts. In water and/or suspensions, those salts are completely free and mobile and can be measured by means of a conductivity (EC) measurement. In soils, peat or other greenhouse media, however, the salts are not totally dissolved.

Their mobility depends on:

• Soil moisture
• Soil compaction
• Soil temperature

These factors determine the quantity of salts being "active" and available to the plants. As the plant nutrients, like nitrate, potassium, etc., are salt ions, the measurement of "active" salt ions gives an immediate information about the plant nutrition status.

The measuring principle of "activity" has been developed by Prof. Dr. Tepe, a former director of the Research Institute for Soil Science and Plant Nutrition Geisenheim, Germany. Since then this method has been applied as an easy, fast and reliable control of plant nutrition.

The probes are made of stainless steel and are available in three different lengths. A special maintenance or storage of the equipment is not required.

Direct measurement of soil salinity

The AM probe:

• measures under the same conditions as the plant root, e.g. same soil moisture, density
• gives precise overview of the individual plant nutrition status on each plant

With the AM probe you can:

• make a precise soil analysis in a few sec.
• quickly make a decision on the use of fertilizers with the help of standard AM values table

The probes are made of stainless steel and a special maintenance or storage of the equipment is not required. Basically the lifetime of the probes is unlimited.

Direct measurement of soil salinity
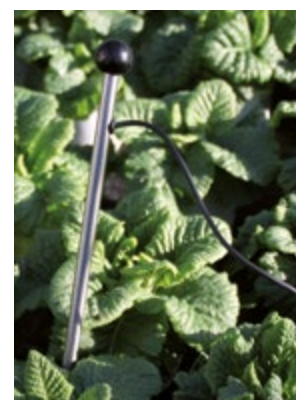
AM 5000

The AM 5000 represents the latest step of development of all activity meters. The production is based on modern SMD-technology which is considered to be much more reliable and temperature-resistant than the conventional wire technology. The rugged housing is splash-proof and field-ready – the operation of the instrument is convenient and simple.

The instrument is checked and calibrated before leaving the factory – a re-calibration is not necessary. The probes are made of stainless steel and are available in three different lengths. A special maintenance or storage of the equipment is not required.

Delivery contents: COMBI AM 5000 basic unit, stainless steel AM probe, 25 cm, manual with optimal values, transport and storage case.

Tables with optimal salt concentration values for all plants ensure an easy and fast interpretation of the measured results. The meter is delivered with those comprehensive tables and a detailed instruction manual.

Recommended applications of the portable AM 5000 to measure soil salinity on the spot - without conducting soil sampling and soil preparation:

• Pot plant production in all terms of plant status, propagation, maturity, etc.
• Nurseries: container plants, particularly if slow-release fertilizers are applied
• Landscape: golf course greens, sports grounds, etc.
• Peat production for immediate check during production process
• Compost plants: to avoid excess of salt concentration in compost soils
• Communities, local governments: determination of soils charged with chloride after winter period
• Consultants, advisors, salesmen, etc.
• Universities, schools, horti-/agricultural educational facilities

Technical data	
Housing	splash-proof, rugged
Dimensions	180 x 83 x 55 mm
Power	9 Volt battery, > 4000 measurements
Connector	8-pin plug
Weight	300 g
Activity measurement	
Meas. range	0 - 2.99 activity in g/l
Resolution	0.01 activity in g/l
Calibration	factory-provided; re-calibration not needed
Probe	stainless steel with special 2-pin-sensor
Probe length	250, 500 or 750 mm
Application	direct measurement of soil salinity

Item-no.	
10190	AM 5000, complete case
Components	
10191	AM 5000, basic unit
10121	Stainless steel probe 250 mm
10122	Stainless steel probe 500 mm
10123	Stainless steel probe 750 mm

EC measurement in solutions

EC 5000

The conductivity meter EC 5000 fulfills all demands of a reliable, easy-to-use instrument for all horticultural applications. The high-quality sensor is made of platinum-plated electrodes. They feature a very fast response and are completely maintenance-free. The integrated temperature sensor provides an automatic and fast temperature compensation.

The instrument is calibrated before leaving the factory and a re-calibration is basically not required. The measuring range up to 200 mS even allows precise measurements of fertilizer stock solutions.

Applications:
- Pot plant production: control of nutrient solutions (fertilizer mixing systems), stock-solutions
- Substrate production: salinity control of peat and cocopeat products
- Hydroponic systems, growing media like rockwool, etc.
- Laboratory use as universal EC-meter

Delivery contents: COMBI EC 5000 basic unit, EC probe with platinum sensors, standard solutions 111.8 mS and 1.4 mS (50 ml each), volume measuring cup, 100 ml, manual with optimal values, transport and storage case.

Technical data	
Housing	splash-proof, rugged
Dimensions	180 x 83 x 55 mm
Power	9 Volt battery, > 4000 measurements
Connector	8-pin plug
Weight	300 g
EC measurement	
Measuring range	0 - 200 mS
Resolution	0.01 mS
Accuracy	± 2 % of measured value
Calibration	calibration solution 1.41 mS and 111.8 mS
Temp.-comp.	automatic
Probe	plastic housing probe with platinum sensors
Probe length	125 mm
Application	conductivity measurement for salinity determination of liquids and solutions

Item-no.	
10290	EC 5000, complete case
Components	
10291	EC 5000, basic unit
10212	EC plastic housing probe with platinum sensors
31003	Calibration solution 1.4 mS, 50 ml
31005	Calibration solution 111.8 mS, 50 ml
90036	Volume measuring cup, 100 ml

Pocket tester

ECO EC Pocket Tester

This economic EC tester simultaneously measures conductivity and temperature, with automatic temperature compensation. Owing to the waterproof case the unit can be used even outdoors or in a very dusty environment. Stability indicator shows when the measured value can be read and the temperature is compensated.

- Automatic calibration
- Battery charge indicator
- Automatic switch-off: after 8 min

Delivery contents:
ECO EC pocket tester, 50 ml calibration solution 12.88 mS.

Technical data	
Housing	waterproof
Power	4 x 1.5 V > 350 h
Range	0 - 20 mS; 0 - 60°C
Resolution	0.01 mS; 0.1°C
Accuracy	± 2% full scale; ± 0.5°C
Calibration	automatic 1-point calibration at 12.88 mS
Probe	replaceable

Item-no.	
23075	ECO EC pocket tester
23076	EC probe
31004	Control solution 50 ml, 12.88 mS

Combo Pocket Tester pH & EC

The Combo Pocket Tester is a universal tester that offers high accuracy pH, conductivity, TDS and temperature measurements.

The water-resistant and floatable tester has a replaceable pH electrode with a pull-out textile diaphragm, as well as an easy to read display and an automatic shut-off. pH and conductivity measurements are automatically temperature compensated.

Delivery contents:
basic unit, pH electrode, tool for electrode replacement, buffer solutions pH 4 and pH 7, standard solution 12.88 mS (bags of 20 ml each), electrode cleaning solution, instructions and batteries.

Technical data	
Housing	waterproof
Power	4 × 1.5V AAA batteries
Dimensions	163 × 40 × 26 mm
Weight	85 g
Temp. comp.	automatically
pH measurement	
Measuring range	0 - 14 pH
Resolution	0.01 pH
Accuracy	± 0.05 pH
Calibration	automatic, 2-point at pH 4 and 7
Electrode	replaceable
EC measurement	
Measuring range	0 - 20 mS/cm
Resolution	0.01 mS/cm
Accuracy	± 2% of the measuring range
Calibration	automatic, 1-point at 12.88 mS
TDS measurement	
Measuring range	0 - 10 ppt
Resolution	0.01 ppt
Accuracy	± 2% of the measuring range
EC / TDS factor	selectable between 0.45 and 1.00
Temperature measurement	
Measuring range	0 - 60 °C
Resolution	0.1 °C
Accuracy	±0.5 °C

Item-no.	
23010	Combo-Pocket-Tester pH & EC
23011	Replacement pH electrode
31012	Buffer solution pH 4, 20 ml
31013	Buffer solution pH 7, 20 ml
31015	Standard solution 12.88 mS, 20 ml

pH and Salinity

pH-EC Flow Control 5000

external relay output
(optional)

pH-EC Flow Control 5000 allows simultaneous, continuous monitoring of pH, conductivity (indication as EC and TDS) and temperature of solutions. The tube-fitting kit provides an easy mounting in all fertigation systems.

Based on the latest microprocessor technology, the instrument has completely been developed and manufactured by STEP Systems in Germany.

The automatic sensor and buffer recognition makes operating errors and misstatements almost impossible – safety of correct application has been perfected.

The display shows temperature, pH, conductivity and TDS values simultaneously.

By exceeding or dropping below the freely adjustable limits:

- **Version without relay output:**
  inverse graphic indication
- **Version with relay output:**
  inverse graphic indication and possibility of external alert system and/or control function for dosage pumps.

The tube-fitting kit enables an easy and fast installation and de-installation of the probes (e.g. in case calibration or replacement).

Menu languages: German, English, Russian.

Delivery contents:

- pH-EC Flow Control 5000 basic unit
- pH flow-through electrode
- Buffer solution pH 4 (100 ml)
- Buffer solution pH 7 (100 ml)
- EC flow-through electrode
- Standard solution 1.4 mS (50 ml)
- Standard solution 111.8 mS (50 ml)
- 2 x tube-fitting kits
- 9 V battery
- Power supply, cable length 160 cm
- Operation manual

Inverse indication of measured values when exceeding or dropping below the individually set limits ensures timely intervention in case of failures. The risk of over-fertilization or under-supply of plants by incorrectly adjusted fertilizer mixing systems is minimized.

With an additional relay card (version with relay output), an external alert system can be connected to the integrated outputs and provides a continuous control of dosing systems.

Technical data	
Measuring range	pH 0 - 14; EC 0 - 200 mS/cm; TDS 0 - 106 000 ppm; t° -20...+80 °C
Resolution	0.01 pH; EC 0.01 mS/cm; TDS 1 ppm / t° 0.1 °C
Accuracy	± 0.02 pH / ± 0.5 °C EC/TDS ±2% of measured value
Temperature compensation	with integrated NTC temperature sensor
pH calibration	automatic, at pH 4 /7 / 10
EC calibration	automatic, at 0.084 /1,41 / 5.0 / 12.88 / 111.8 mS/cm
EC probe	EC plastic housing probe, 8-pin plug, 110 cm cable
pH probe	gel-filled pH electrode, BNC plug, 110 cm cable
Max. pressure	5 bar (for pH and EC probes)
Data logger	optional (item no. 10140)
Alarm	**Version without relay output:** visual inverse graphic indication **Version with relay output:** visual and 1 x relay output, Ø 3.5 mm, max. 50 Vac / 1A
Alarm delay	0-255 s after exceeding or dropping below the limits
Conversion factor EC-TDS	automatic
Power	9 V with external power supply (continuous operation) or 9 V block battery, > 3,000 measurements (short time operation)
Dimensions	83 x 180 x 55 mm
Weight	300 g (basic unit)

Item-no.	
52030A	pH-EC Flow Control 5000, set
52030R	pH-EC Flow Control 5000 with relay output, set
52020A	pH Flow Control 5000, set
52020R	pH Flow Control 5000 with relay output, set
52015A	EC Flow Control 5000, set
52015R	EC Flow Control 5000 with relay output, set
Components	
10140	Data logger function
90079	Connection cable 8-pin to USB
52021	pH flow-through electrode
52012	EC flow-through electrode
52009	Tube-fitting kit for one probe (inner diameter 32 mm, outside Ø 40 mm, PVC, without thread)

Further configurations:

pH Flow Control 5000

power supply

external relay output
(optional)

The pH-Flow Control 5000 is a solid flow meter for continuous pH measurement in pipework.

Delivery contents: pH Flow Control 5000 basic unit, pH flow-through electrode, buffer solutions pH 4 and pH 7 (each 100 ml), tube-fitting kit, 9 V battery, power supply, cable length 160 cm, operation manual.

EC Flow Control 5000

power supply

external relay output
(optional)

EC Flow Control 5000 allows simultaneous, continuous monitoring of conductivity and temperature of nutrient solutions.

Delivery contents: EC Flow Control 5000 basic unit, EC flow-through electrode, standard solutions 1.4 mS and 111.8 mS (each 50 ml), tube-fitting kit, 9 V battery, power supply, cable length 160 cm, operation manual.

COMBI 5000: multi-function unit

pH + AM 5000: pH and activity measurement

Measurement of pH and salinity directly in the soil and in substrates. Ideal combination for production, consultants and service in all fields of horticulture and nurseries without application of liquid fertilization.

Suitable probes and solutions:
• pH insertion probe (item-no. 10302)
• buffer solution pH 4 (item-no. 31001)
• buffer solution pH 7 (item-no. 31002)
• stainless steel AM probe, 25 cm, 50 cm or 75 cm

Delivery contents:
COMBI pH + AM 5000 basic unit, pH insertion probe, buffer solutions pH 4 and pH 7 (100 ml each), storage solution for the probe (3 mol KCL, 100 ml), stainless steel AM probe, 25 cm, piercing pin, manual with optimal values, transport and storage case.

Item-no.	
10590	pH + AM 5000, complete case

pH + EC 5000: pH and EC measurement

Simultaneous pH and EC measurement with just one device. Perfect configuration for all users of hydroponic growing systems, for consultants and sellers of liquid fertilizers, fertilizer mixers, etc.

Suitable probes and solutions:
• pH insertion probe (item-no. 10302)
• buffer solution pH 4 (item-no. 31001) and pH 7 (item-no. 31002)
• EC probe with platinum sensors (item-no. 10212)
• standard solution 1.4 mS (item 31003) and 111.8 mS (item 31005)

Delivery contents:
COMBI pH + EC 5000 basic unit, pH insertion probe, buffer solutions pH 4 and pH 7 (100 ml each), EC probe with platinum sensors, standard solutions 111.8 mS and 1.4 mS (50 ml each), volume measuring cup, 100 ml, piercing pin, manual with optimal values, transport and storage case.

Item-no.	
10690	pH + EC 5000, complete case

COMBI 5000: multi-function unit

EC + AM 5000:
EC and activity measurement

Measurement of salinity directly in the crop (activity) and conductivity of nutrient and stock solutions with only one device. Optimal configuration for substrate production, ornamental plants and composting facilities.

Suitable probes and solutions:
• EC probe with platinum sensors (item-no. 10212)
• standard solution 1.4 mS (item-no. 31003)
• standard solution 111.8 mS (item-no. 31005)
• stainless steel AM probe, 25 cm, 50 cm or 75 cm

Delivery contents:
COMBI EC + AM 5000 basic unit, EC probe with platinum sensors, standard solutions 111.8 mS and 1.4 mS (50 ml each), stainless steel AM probe, 25 cm, volume measuring cup, 100 ml, manual with optimal values, transport and storage case.

Item-no.	
10490	EC + AM 5000, complete case

pH + EC + AM 5000:
pH, EC and activity measurement

This configuration provides a combination of the most important measuring parameters: pH, conductivity and activity. Perfect solution for greenhouses, consulting services and educational facilities for practical training.

Suitable probes and solutions:
• pH insertion probe (item-no. 10302)
• buffer solutions pH 4 & 7 (items 31001/31002)
• EC probe with platinum sensors (item-no. 10212)
• standard solutions 1.4 & 111.8 mS (items 31003/31005)
• stainless steel AM probe, 25 cm, 50 cm or 75 cm

Delivery contents: COMBI pH + EC + AM 5000 basic unit, pH insertion probe, buffer solutions pH 4 and pH 7 (100 ml each), EC probe, standard solutions 111.8 mS and 1.4 mS (50 ml each), AM probe, 25 cm, piercing pin, volume measuring cup, 100 ml, manual with optimal values, transport and storage case.

Item-no.	
10790	pH + EC + AM 5000, complete case

COMBI 5000
pH + EC + AM + VWC + t°

The COMBI 5000 is a universal instrument for the immediate measurement of the most important parameters in plant production, such as pH value, EC value, soil salinity, soil moisture and temperature.

Delivery contents: COMBI 5000 basic unit, pH insertion probe, buffer solutions pH 4 and pH 7 (100 ml each), EC probe with platinum sensors, standard solutions 1.4 mS and 111.8 mS (50 ml each), multi-probe, 250 mm, piercing pin, spray bottle with snorkel, 250 ml, volume measuring cup, 100 ml, manual with optimal values, aluminium case.

Item-no.	
10900	pH + EC + AM + moisture + temp., complete case

COMBI 5000: pH + EC + AM + VWC + temp. + RH + hPa + C°

The all-round talent for plant and vegetable production. With the handheld meter COMBI 5000, the growth-relevant parameters such as pH, EC, salinity, soil moisture and temperature, air humidity and temperature can be determined quickly and precisely.

Delivery contents: COMBI 5000 basic unit, pH probe, buffer solutions pH 4 and pH 7 (100 ml each), EC probe, standard solutions 1.4 mS and 111.8 mS (50 ml each), multi-probe (250 mm), HPT probe, piercing pin, spray bottle with snorkel (250 ml), volume measuring cup, 100 ml, manual with optimal values, transport case.

Item-no.	
10920	pH + EC + AM + moisture + temp. + RH + hPa + C°, complete case

Technical data

COMBI 5000 basic unit (item no. 10910)	
Housing	splash-proof, rugged
Power	9 Volt battery, >400 measurements
Display	alphanumeric, reflective
Switch-off function	automatic, after 4 min
Connector	BNC plug and 8-pin plug
Dimensions	180 x 83 x 55 mm
Weight	300 g

pH probe (item no. 10302)	
Measuring range	0 - 14 pH
Resolution	0.01 pH
Accuracy	± 0.02 pH
Calibration	automatic
Probe	gel-filled insertion probe, 125 mm
Connector	BNC plug
Application	pH measurement directly in soils, substrates and liquids

EC probe (item no. 10212)	
Measuring range	0 - 200 mS/cm
Resolution	0.001 - 0.01 mS/cm
Accuracy	± 2 % from measured value
Calibration	automatic
Probe	plastic with platinum sensors, 125 mm
Connector	8-pin plug
Application	conductivity measurement in liquids, e.g. nutrient and stock solutions

Multi-probe (item no. 10191)	
Probe	length 250 mm, PVC, Ø 10 mm
Sensors	FDR capacitive (moisture), NTC (temperature), bi-pol (salinity)
t° compensation	automatic
Connector	8-pin plug
Applications	measurement of salinity, temperature, soil and substrate moisture

Activity measurement (salinity)	
Measuring range	0 - 2.99 g/l of active salts
Resolution	0.01 g/l of active salts
Calibration	factory calibration, stable

Temperature measurement	
Measuring range	-10 to +50°C
Resolution	0.1°C

Moisture measurement	
Measuring range	0.5 - 60 %VWC
Resolution	0.1 %VWC
Calibration	0%VWC in air / 60%VWC in water

HTP probe (item no. 10130) humidity – temperature – pressure	
Measuring range	10 … 100 RH% / 260 … 1260 hPa / -20 … +80 °C
Resolution	0.1 RH% / 0.1 hPa / 0.1 °C
Accuracy	2% / 0.5 hPa / ±0,2%
Calibration	factory calibration
Connector	8-pin plug

AM probe (item no. 10121)	
Measuring range	0 - 2.99 activity in g/l
Resolution	0.01 activity in g/l
Calibration	factory calibration, stable
Probe	stainless steel with 2-pol-sensor
Probe length	250, 500 or 750 mm
Connector	8-pin plug
Application	direct measurement of soil salinity

Data logger function (item no. 10140)	
Measuring rate	1 min - 24 h
Memory	2620 records

Configurations

Item-no.	
COMBI 5000: single-function	
10190	AM 5000, complete case
10290	EC 5000, complete case
10390	pH 5000, complete case
10850	MST 5000, complete case
COMBI 5000: multi-function	
10490	EC + AM 5000, complete case
10590	pH + AM 5000, complete case
10690	pH + EC, complete case
10790	pH + EC + AM, complete case
10890	AM + moisture + temp., complete case
10892	EC + AM + moisture + temp., complete case
10895	pH + AM + moisture + temp., compl. case
10900	pH + EC + AM + moisture + temp., complete case
10920	pH + EC + AM + VWC + temp. + RH + hPa + C°, complete case

All devices can be individually configured and the case can be equipped accordingly.

Attention:

The units are designed in such a way that retrofitting to further parameters is basically not possible.

To have the possibility of future retrofitting, we recommend to purchase the basic unit COMBI 5000 (item no. 10910) with all functions. In this case, an upgrade is possible by simply purchasing the respective measuring probe.

Item-no.	
Component parts	
10910	COMBI 5000, basic unit
10302	pH insertion probe
31001	Buffer solution pH 4, 100 ml
31002	Buffer solution pH 7, 100 ml
10212	EC probe with platinum sensors
31003	Standard solution 1.4 mS, 50 ml
31005	Standard solution 111.8 mS, 50 ml
10192	Multi-probe: for simultaneous measurement of activity, soil moisture and temperature
10130	HPT probe: for simultaneous measurement of humidity, air temperature and air pressure
10124	Insertion temperature probe
40821	Soil moisture probe
10121	Stainless steel AM probe, 250 mm
10122	Stainless steel AM probe, 500 mm
10123	Stainless steel AM probe, 750 mm
10140	Data logger function
90079	Connection cable 8-pin to USB
23041	Spray bottle with snorkel, 250 ml
90036	Volume measuring cup, 100 ml
90020	Piercing pin

Complete photometric analyses system

LASA AGRO 3900

The LASA AGRO 3900 workstation is a well-organized workplace where easy operations allow rational, systematic analyses of main nutrients and numerous trace elements without any previous knowledge of chemistry.

STEP Systems GmbH programs the photometers especially for agricultural use. This enables evaluation in mg / 100 g soil, mg / liter substrate and mg / liter solution.

Within a very short period of time the user has a complete nutrient analysis of the soil, substrate or fertilizer solution and can thus achieve the greatest possible agricultural yields through precise fertilization.

Besides easy handling, fast execution is the outstanding characteristic of the system. For the plant producer, long waiting periods for analysis results means an unnecessary risk: immediate knowledge about the nutritional status of the plant is the basis of successful agriculture and creates reliability in agricultural and horticultural management.

Perfect applications for the complete LASA AGRO 3900 workstation are particularly in:

• Quality laboratories of substrate production
• Horticultural plant production
• Research institutes
• Horticultural and agricultural schools and universities
• Agricultural and horticultural service centres

Place the prepared cuvette into the photometer and all relevant information provided on it will be immediately detected during the proven 10-fold rotation measurement. Everything is documented together with the measuring result.

Own methods with linear and non-linear calibration curves can be programmed via the spectra recording (320-1100 nm), concentration, extinction and turbidity measurement. The variable cuvette sizes of 10 to 50 mm thickness allow wide measuring ranges: from trace analysis in drinking water through the soil analysis to high concentrations in stock solutions.

IBR+ increases the reliability of your measurement values

Lot number and expiry date information is now included on the 2D barcode, this additional information is transferred to the instrument and documented with the measurement value.

Rapid data updates

Programming of methods into a spectro-photometer has never been so easy. Simply hold the cuvette test box in front of the LASA AGRO 3900 RFID* module, wait for the signal tone and it's done. Measurement begins straight away with accurate evaluation data for an accurate result.

Quality assurance made easy with AQA+

AQA procedures can now be easily defined and documented within the instrument without additional software. Current batch certificates (for the purpose of GMP/GLP results documentation) can be found on the RFID* tag on the cuvette box. Thanks to this RFID* technology, all batch-specific information can be retrieved immediately on the LASA AGRO 3900 and printed out.

Easy data transfer

Transfer your measurement data easily via a USB stick or an Ethernet connection. The same applies for software updates. The LASA AGRO 3900 can install the most up-to-date device software from our website via Ethernet, so your photometer always has the latest update.

* RFID technology available in all EU countries plus e.g. Norway, Switzerland, Serbia, Macedonia, Turkey. For other countries please ask us.

Technical data	
Application	soil, substrate, water and leaf analyses
Wavelength range	320 - 1100 nm
Wavelength accuracy	± 1.5 nm (wavelength range 340 – 900 nm)
Wavelength reproducibility	± 0.1 nm
Beam height	10 nm
2D barcode	lot number and expiry date information
IBR+	10 times measurement
Display	touch-screen 800 x 480 pxl
Data storage	2000 measurement data, 100 user programs
Outputs	2 x USB type A, USB type B, Ethernet
Operating conditions	10 °C - 40 °C, 80% humidity
Manual languages	German, English, French, Italian, Spanish, Portuguese, Czech, Danish, Dutch, Hungarian, Polish, Romanian, Russian, Slovenian, Swedish, Turkish, Greek, Finnish, Croatian, Bulgarian, Serbian, Slovakian
Protection class	IP 30
Power supply	table power supply, 110 to 240V; 50/60Hz
Dimensions	151 x 350 x 255 mm
Weight	4.2 kg

LASA AGRO comparison in 30 sec.

Item-no.	
20391	LASA AGRO 3900 basic unit without RFID
20390	LASA AGRO 3900 workstation without RFID, complete photometer LASA AGRO 3900, 1 set variable piston pipettes including pipette tips, cuvette holder
20396	LASA AGRO 3900 basic unit with RFID
20395	LASA AGRO 3900 workstation with RFID, complete photometer LASA AGRO 3900, 1 set variable piston pipettes including pipette tips, cuvette holder, addista 703

Mobile photometric analyses system

LASA AGRO 1900

Soil preparation

Extraction Case

The mobile system LASA AGRO 1900 provides the possibility of fast and precise on-spot-determinations. The complete equipment is packed in two rugged aluminium cases.

With over 220 pre-programmed methods in a waterproof, shock tested design this spectrophotometer delivers lab quality results in a portable, field ready instrument.

The photometer scores in all applications in the field, wherever and whenever it shall be used. Even in dusty and wet environments where other devices cannot be used, you can easily perform your analyses with the LASA AGRO 1900.

The instrument has a large, user-friendly display and provides a simple menu navigation for easy analyses procedures even under harshest conditions.

The light source of the photometer is a Xenon flash which is only switched on for measurements because of power saving reasons.

The measuring results can be carried out in

• mg / 100 g soil
• mg / liter substrate
• mg / liter solution

Select the desired parameter from a list by pressing a button, insert the prepared test cuvette and start the measurement - that's it. The LASA AGRO 1900 stores up to 500 readings that are read out via a built-in plug-in mini USB interface. The readings can easily be transferred into any table format, e.g. in MS Excel.

The supplied plug-in is also the AC adapter and battery charger of the photometer.

The mobile systems LASA AGRO 1900 is an advantageous solution for

• Horticultural plant producers with different production locations
• Peat, substrate producers with different production locations
• Advisory associations with different seats
• Consultants and service partners in horti- and agriculture

Technical data	
Application	soil, substrate, water and leaf analyses
Wavelength range	340 - 800 nm
Wavelength accuracy	± 2 nm
Beam height	5 nm
Optical system	reference beam, spectral
Sampl cell	round cell, 13 mm
Power supply	4 x AA size Alkaline or rechargeable Nickel Metal Hydride (NiMH) batteries (4x)
Data storage	500 measurement data
Outputs	mini USB
Protection class	IP 67
Dimensions	178 x 261 x 98 mm
Weight	1.5 kg (basic unit)

Item-no.	
20190	LASA AGRO 1900 mobil Complete case with basic equipment
Components LASA AGRO 1900	
20191	LASA AGRO 1900 mobil with additional module
20278	Variable piston pipette 0.1 – 1.0 ml
20265	Variable piston pipette 1.0 – 5.0 ml
20279	Pipette tips 0.1 – 1.0 ml (100 pcs.)
20268	Pipette tips 1.0 – 5.0 ml (75 pcs.)
LYW915	Cuvette holder
20290	Rechargeable NiMH batteries (4x)
20022	Plastic transport case
LCK 339	Cuvette test for Nitrate
LCK 303	Cuvette test for Ammonium
LCK 049	Cuvette test for Phosphate
LCK 328	Cuvette test for Potassium
LCK 326	Cuvette test for Magnesium
LCA 703	addista stadard solution (Nitrate, Phosphate, Ammonium, Chloride)

Sample preparation is an essential part of the analytical process. Only standardised sample preparation, applying always the same technical approach and extraction method, guarantees precise and reproducible measurement results. Extraction (or digestion) means separation, dissolution of the elements to be analysed from the solids (e.g. soil or peat moss or any other growing medium). Our extraction concentrate (item 20037) is specially designed as a digestion solution for all macro and micro-elements, providing solution of all plant available nutrients. For analyses of water (e.g. ground or irrigation water) or nutrient solutions no extraction is necessary, because the elements are already in a dissolved form.

The extraction case is a necessary equipment set for soil and substrate analyses made with the photometers LASA AGRO. Except distilled water, the extraction case (item 20030) contains all equipment necessary for soil digestions, e.g. solar balance, sieve, funnels, folded filter papers, 1 litre extraction concentrate etc.

Delivery contents: extraction concentrate, 1l, solar balance, 6 x plastic funnels Ø120 mm, 6 x extraction bottle 1l, 6 x volumetric beaker, 100 ml, measuring beaker 1l, wooden frame sieve, 8 x reaction glasses with screw top, reaction glass holder, special folded filter papers, 100 pcs., aluminium transport case.

Item-no.	
20030	Extraction case complete for sample preparation
Components:	
43020	Solar balance, 1 g graduation
20031	Plastic funnels Ø120 mm, SU 6 pcs.
20032	Extraction bottle 1 l - wide neck, SU 6 pcs.
20033	Volumetric beaker, 100 ml, SU 6 pcs.
20034	Measuring beaker 1 l, with graduation
21049	Wooden frame sieve, 10mm mesh width, incl. collecting tray
20038	Reaction glasses with screw top, 8 pcs.
20039	Reaction glass holder
20035	Aluminium transport case
20036	Special folded filter papers, 100 pcs.
20037	Extraction concentrate, 1 l for soil digestions

Cuvette tests

LCK Cuvette Tests: Insert, Read, Finish

Simple and well-designed to prevent errors. Features include brief instructions and pictures inside the box lid. Ready to use: carry out the test without having to wade through complicated instructions.

Simple

Pre-dosed, ready-to-use reagents; no rinsing steps and reagent blank values; automatic evaluation.

Precision plus safety

100% safe every step of the way: no contact with reagents, thanks to Dosicap Zip; completely reliable results with Addista standard solutions, round robin test solutions.
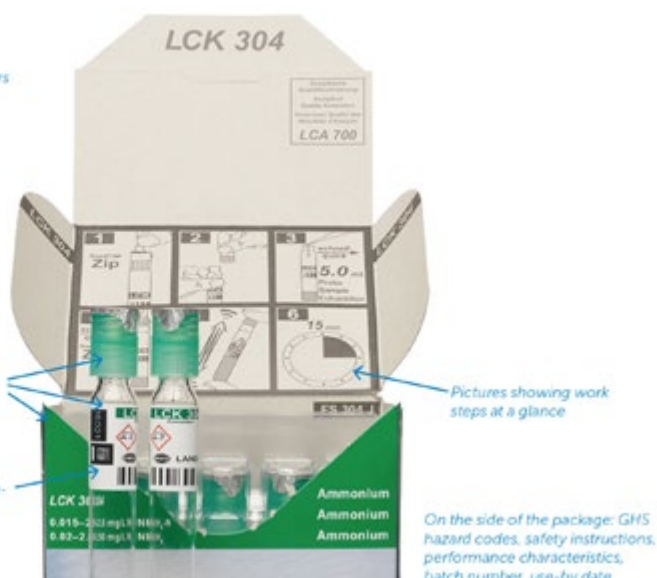
Fast

The measurement results are immediately available without any reagent preparation or carrying out time consuming calculations.

Environmentally friendly

The superior Hach cuvette reduces the consumption of chemicals. There is also a recycling service for used reagents, where they will be disposed of at our Environment Centre.

Safe

The closed cuvette system and reduced chemical quantities ensure maximum operating safety and reliable results. Packages and caps are colour-coded for fast and easy parameter and range recognition. The RFID tag on each box contains the lot specific Certificate of Analysis. In addition, the user will receive a notification if shelf life has been expired.

Cuvette tests

Cuvette test is used in a multi-purpose way for:

• Transport
• Dosage
• Digestion
• Reaction
• Measurement
• Disposal

Further cuvette tests on request.

	Nitrate	Nitrate	Ammonium	Phosphate
Test no.	LCK 339	LCK 340	LCK 303	LCK 049
Element	NO_3-N	NO_3-N	NH_4-N	P_2O_5
Measuring range	0.23 - 13.5 mg/l	5 - 35 mg/l	2 - 47 mg/l	5 - 90 mg/l
Pack contents	25	25	25	25

	Potassium	Magnesium	Calcium	Sulphate
Test no.	LCK 328	LCK 326	LCK 327	LCK 153
Element	K_2O	Mg	Ca	SO_4
Measuring range	8 - 50 mg/l	0.5 - 50 mg/l	5 - 100 mg/l	40 - 150 mg/l
Pack contents	24	25	25	25

	Iron	Copper	Zinc	Molybdenum
Test no.	LCK 321	LCK 329	LCK 360	LCK 330
Element	Fe	Cu	Zn	Mo
Measuring range	0.2 - 6 mg/l	0.1 - 8 mg/l	0.2 - 6 mg/l	1 - 10 mg/l
Pack contents	25	25	24	25

	Manganese	Boron	Carbonate **	Chloride
Test no.	LCW 032	LCK 307	LCK 388	LCK 311
Element	Mn	B	CO_3	Cl
Measuring range	0.2 - 5 mg/l 0.02 - 1 mg/l*	0.05 - 2.5 mg/l	55 - 550 mg/l	1 - 70 mg/l
Pack contents	50	25	25	24

*necessary accessories: 50 mm rectangle cuvette (item-no.: 90096)

**necessary accessories: thermostat

Single Elements

addista

Prerequisite for precise and accurate results is a permanent quality assurance. Only analytical quality assurance turns your measured values into reliable analysis results. Addista is the system with which you can check the precision and accuracy at any time. Regular checks safe guard the long-term reliability of your measuring system, of your handling and the materials you use (pipette, reagent, photometer, etc.).

Standard solutions

Standard solutions are used to test the equipment (photometer, pipettes, cuvette tests, etc.) and the user's working procedures.

Spiking solutions

Spiking solutions give assurance as whether the sample contains spurious ingredients that could falsify the result.

Ring test solutions

Ring test solutions of unknown concentration are analysed by the user and the result is sent in. Working procedures and materials are tested in the ring test. Participation is confirmed by means of an inter-laboratory test certificate.

A participation of the user in round robin tests is often a prerequisite for the acceptance of equivalence of operational analysis methods.

Upon successful participation in the HACH round robin test, the student will receive a full test evaluation plus certificate.

Item-no.	To be used for tests
LCA 700	LCK 328 Potassium (max. 85 determinations), LCK 311 Chloride (max. 85 determinations)
LCA 701	LCK 321 Iron (max. 42 determinations) LCK 329 Copper (max. 42 determinations) LCK 360 Zinc (max. 425 determinations)
LCA 703	LCK 049 Phosphate (max. 17 determinations) LCK 303 Ammonium (max. 425 determinations) LCK 311 Chloride (max. 85 determinations) LCK 339 Nitrate (max. 85 determinations)

Further Addista solutions on request.

Analysis and quality assurance measures are inseparably interlinked. There is much more to ensuring high quality measurement results than simply the type of analytical method (standard/norm vs. operational analysis) that is used. The care taken over the individual work steps and the quality assurance measures that are implemented, play a much greater role. Hach® supports users of LCK Cuvette Tests by carrying out a substantial part of the quality assurance measures on their behalf. This means that the relevant quality and batch certificates are always available.

Evaluation

Evaluation of the measuring results can be carried out in:
• mg / 100 g soil for soil analyses
• mg / liter substrate for substrate, peat analyses
• mg / liter solution for nutritive solutions, drainage water, etc.

Based on tables, the interpretation of the analysis results for the different cultures is compiled specifically for each application. Thus, the current nutritional status of the plant is determined and a corresponding fertilizing recommendation can be made immediately.

It goes without saying that we will also later contact you by phone or personally in case of further technical application questions.

Interpretation

An important component of the LASA AGRO system is the interpretation of the measured values.

The evaluation using tables is a simple way based on the long-term experience of the official German Agricultural Investigation and Research Institutions (VDLUFA). For both horticultural and agricultural outdoor crops, the tabular guide values are given in mg / 100 g soil nutrient, either as pure nutrient (e.g. with N, Mg) or in the oxide form, e.g. K_2O or P_2O_5. A conversion is no longer necessary.

The tables help to determine the soil class and provide information on the required fertilizer quantity. For substrate analyses, crops are divided into three groups with the respective nutrient target values and a calculation example in case of nutrient deficiency.

All tables are included in the accompanying manual of the LASA AGRO system

Seminars on plant nutrition

When buying the laboratory we also offer very informative training seminars on plant nutrition (optional).

This allows an intense addressing to the relevant issues and problems of the user.

In the framework of such seminars there is also a practical part, including demonstration of the LASA AGRO and further analytical equipment and interpretation of measurement results.

Item-no.	
20080	Seminar on plant nutrition in general and soil analyses with LASA AGRO in particular. Duration: min. 3 h

Here you will find

the complete video manual

for the LASA AGRO photometric system

Soil and water analytics

Compact Photometer PF-3

Detailed analysis is the basis for keeping soil productive and biologically active.

In order to plan all measures (fertilization, liming, etc.) that affect the soil effectively and efficiently, it is important to determine all important soil parameters at first. The compact photometer PF-3 covers the important soil parameters like ammonium, potassium, nitrate and phosphate.

Together with VISOCOLOR® ECO tests and a suitable sample preparation for soil extraction, the PF3 allows a quick view on the nutrient content of the soil.

- Measurement of the main soil nutrients: Nitrogen (N), phosphate (P) and potassium (K)
- Power supply with batteries or rechargeable batteries
- Results in different units
- Free of charge data export software
- Data transfer via USB port

Depending on which parameter is to be analysed, the nutrients are extracted from the soil sample either with a calcium acetate lactate solution (CAL) or with a calcium chloride solution ($CaCl_2$).

If national regulations for soil analysis or local geological conditions require it, the VISOCOLOR® soil kit can also be used with other extraction solutions.

Evaluation of the convenient NANOCOLOR® tests is also possible.

Delivery contents:

compact Photometer PF-3, VISOCOLOR ECO Tests for Nitrate, Potassium, Ammonium, Phosphate, pH test sticks 0 - 9 pH, accessories for sample preparation (scale, sieve, etc.), manual, batteries, case.

Technical data	
Type	LED-Photometer with 3 Interference filters
Wavelengths	365 nm, 450 nm, 660 nm
Accuracy	± 2 nm, bandwidth at half transmission 10-12 nm
Cuvette slot	Round cuvettes 16 mm AD
Measuring modes	Pre-programmed MN tests VISOCOLOR / NANOCOLOR
Memory	50 results
Power supply	3 AA batteries, USB interface; optional internal battery pack
Housing	Water proof according to IP 68
Dimensions	170 x 95 x 68 mm

Item-no.	
20100	Analytical case PF-3, complete case
VISOCOLOR ECO Tests	
20101	Ammonium 3 (0.1 -2.0 mg/l NH_4-N), 50 tests
20102	Potassium (2 - 15 mg/l K^+), 60 tests
20103	Nitrate (4 - 60 mg/l NO_3^-), 100 tests
20104	Phosphate (0.2 - 5.0 mg/l PO_4-P), 80 tests
Optional NANOCOLOR Tests, 20 tests each	
20131	Ammonium 10 (0.2 - 7.0 mg/l NH_4-N)
20132	Ammonium 50 (1.0 - 40.0 mg/l NH_4-N)
20133	Potassium 50 (2-50 mg/l K^+)
20134	Nitrate 50 (2 - 100 mg/l NO_3^-)
20135	Phosphate 5 (0.20 - 5.00 mg/l PO_4-P)
20136	Phosphate 15 (0.3 - 15.0 mg/l PO_4-P)

Quick tests

Indication Test Sticks

Test sticks for fast, semi-quantitative determinations of different parameters in solutions. Indication test papers meet the requirements of a modern testing method:

- **Fast:** dip in and read off
- **Easy-to-use:** only a test stick is required for a screening test - no apparatus equipment is needed
- **Long life:** can be used for 2 years (average) when stored below 30°C

Indicator test sticks are packed at 100 pcs per container (Calcium 60 pcs, Multi-Stick 50 pcs, Chlorine 75 pcs).

Further tests on request.

Item-no.	Parameter
33011	Merckoquant Nitrate test strips, 10-25-50-100-250-500 mg/l NO_3^-, 0-100 mg/l Nitrite-warning indicator
30048	Chlorine sensitive 0-0.5-1-2-5-10-20 mg/l Cl_2 yellow to violet
30049	Chlorine 0-25-50-100-200-500 mg/l Cl_2 white to red-violet
30050	Ammonium 10-25-50-100-200-400 mg/l NH_4^+ yellow to orange
30051	Calcium 10-25-50-100 mg/l Ca^{2+} yellow to red
30052	Carbonate hardness 4-8-12-16-24 °d orange to green
30053	Chloride 500-1000-1500-2000->3000 mg/l Cl^- brown to yellow
30054	Iron 3-10-25-50-100-250-500 mg/l Fe^{2+} white to blue-violet
30056	Nitrite 0-0.1-0.3-0.6-1-2-3 mg/l NO^2 yellow to red
30057	Peroxide 1-3-10-30-100 mg/l H_2O_2 white to blue
30059	Total hardness 3-4-7-14-21 °d Water hardness green to red
30060	Multi-Stick Total hardness, carbonate hardness, pH, e.g. for fish keeping

Titration Tests

Titration test kits are complete plastic boxes with all reagents and accessories for a test.

The results are given directly in mg/l.

Contents of a titrimetric test kit:

graduated syringe, indicator solution, pre-adjusted titration solution, titration test tube.

Item-no.	Parameter
30070	Carbonate hardness 1°d Carbonate hardness 50 at 10°d
30071	Total hardness 1°dH = 1 drop 50 at 10°dH

Nitrachek

Reflectometer for the optical evaluation of Merckoquant nitrate test strips which are used to measure the nitrate content of plants, soil solutions (N-min = mineralized Nitrogen), water etc. Data memory for the last 20 measurements with time and date. Automatic multiplication with correction factor.

• Measuring range: 0 - 500 mg/l
• Accuracy: ± 10% after setting the correction factor

Delivery contents: Nitrachek basic unit, 9 Volt battery, standard solution 100 ppm, manual.

Item-no.	
33010	Nitrachek 404 with calibration solution 100 mg/l NO_3, 50 ml
	Accessories
33011	Merckoquant Nitrate test strips, 100 pcs 0-10-25-50-100-250-500 mg/l NO_3, 0-100 mg/l Nitrite-warning indicator
33012	Calibration solution 100 mg/l NO_3, 50 ml
33013	Round filter paper Ø 15 cm, 100 pcs. for soil filtration
33014	Handbook (in German language)

Nitrate Test Kit

Complete nitrate test kit for fast on-site measurement of mineralized nitrogen. The complete test kit includes all necessary equipment for preparation and measurement of nitrate in soil, water and plant tissue samples. The measuring system has been applied for many years in agriculture and horticulture and has been tested for a long time in various plant research institutes and academies.

The detailed handbook (in German language) provides full information about:

• How to prepare the sample
• How to make the analyses
• How to evaluate and interpret the measuring results

Delivery contents:

• Nitrachek, item.-no. 33010
• Merckoquant Nitrate test strips, item.-no. 33011
• Calibration solution, item.-no. 33012
• Portable scale, item.-no. 43030
• Plastic sample beakers, item.-no. 90036
• Round filter papers, item.-no. 33013
• Household mixer, for homogenisation of plant tissue samples, e.g. vegetables
• Complete instruction handbook (German language) and operation manual (English language)
• Rugged aluminium case

Video how-to-use

Item-no.	
33100	Nitrate test kit

Neccessary accessories:
Merckoquant Nitrate test strips, item-no.33011

LAQUA Nitrate Meter

LAQUA tester has a flat ion sensor, specially developed for very small sample amounts (from 0.3 ml).

Large measuring range (6 - 9,900 ppm) allows measurement of high concentrations without prior dilution, e.g. plant juices.

• Measurements without sample dilution
• No need for a beaker or other labware
• No disturbance influences
• Auto-HOLD-function
• Automatic switch-off after 30 min
• Temperature compensation
• Replaceable electrode
• Switchable backlight
• Multiplication calibration
• Low battery indicator
• 400 hours battery life: continuous use without backlight
• Packed in handy carrying case

Technical data	
Measuring principle	Ion selective measuring method
Minimum sample volume	0.3 ml
Measuring range	6 - 9,900 ppm (mg/l) NO_3^-
Resolution	1, 10 or 100 ppm
Calibration	2-point-calibration
Accuracy	±10% of reading value
Display	custom (monochrome) digital LCD with backlight
Power	2 x CR2032
Housing	waterproof, IP 67
Temp. compensation	automatic
Operating temp.	5°C to 40°C, 85% rh
Dimensions	164 x 29 x 20 mm
Weight	50 g (basic unit without batteries)

Delivery contents:

LAQUA nitrate meter, standard solutions 150 ppm and 2,000 ppm (14 ml each), pipette, 2 x CR2032 batteries, manual, storage case.

Item-no.	
33300	LAQUA Nitrate Meter, complete
33310	Nitrate Standard 2000 ppm 6 x 14 ml
33320	Nitrate Standard 150 ppm 6 x 14 ml
33301	Replacement electrode

Further models (for K, Ca, Na) on request.

Chlorophyll Meter

The Chlorophyll Meter instantly measures chlorophyll content or "greenness" of your plants to reduce the risk of yield-limiting deficiencies or costly overfertilizing. The unit quantifies subtle changes or trends in plant health long before they're visible to the human eye.

Non-invasive measurement; simply clamp the meter over leafy tissue, and receive an indexed chlorophyll content reading in less than 2 sec. Assess nitrogen needs by comparing in-field SPAD readings to university guidelines or to adequately fertilized reference strips. Research shows a strong correlation between SPAD measurements and leaf N content.

Technical data	
SPAD Value	Index of relative chlorophyll content; -9.9 to 199.9
Measurement Area	2 mm x 3 mm
Repeatability	within ±0.3 SPAD unit

Item-no.	
33200	SPAD 502 Plus Chlorophyll Meter

Seives	Sieve shaker	Oven

Haver Test Sieves

Test sieves made of stainless steel in accordance with DIN ISO 3310/1.
• Diameter 200 mm
• Inside height 50 mm
• Metal wire weave

Other sizes and optional accessories on request.

Item-no.	
21041	Mesh 63 µm
21042	Mesh 125 µm
21043	Mesh 250 µm
21044	Mesh 500 µm
21045	Mesh 1 mm
21046	Mesh 2 mm
21047	Mesh 5 mm
21048	Mesh 10 mm
21050	Sieve pan

Test Sieve Shaker

Analytical sieve machine Premium with Classic clamping system for dry sieving complete with:

• Machine cover with sight glass
• Clamping system, consisting of two guide rods M16 x 660 mm and two clamping screws

Further sieving machines on request.

Technical data	
Applications	dry sieving
Sieve diameters	Ø 50, 76.2 (3"), 100, 150, 200, 203 (8")
Sample weight	approx. 3 kg
Clamping system	classic
Installation	wall mounting
Operating voltage	10 – 220 Volt, 50 – 60 Hertz
Maximum number of sieves	9 (usable height 50 mm), 15 (usable height 32 mm)

Item-no.	
21040	Test Sieve Shaker

Drying Oven

Drying oven with natural convection used for thermal processes and heated storage. Exhaust duct at the back of the unit with manually adjustable slide.

Microprocessor controller. Integrated timer. Over-temperature protection with visual alarm. Digital temperature setting with degree accuracy.

Technical data	
Temp. range	+50 to 300°C
Temperature fluctuation (time)	± 0.4
Interior volume	56 l
Convection type	natural convection
Number of tray, max	5 (2 trays incl.)
Max. load per tray	50 kg
Inside cm	400x 360 x 390 mm
Outside cm	590 x 600 x 700 mm
Weight	52 kg

Item-no.	
21020	Drying oven DL56
21021	Tray for drying oven DL56

We are pleased to offer more products for your complete laboratory equipment. Please contact us.

Measuring Cylinder

PP, tall form. Conformity certified according to DIN 12681/ISO 6706, transparent, Moulded graduation. Hexagon stand.

Further laboratory equipment on request.

Item-no.	Capacity	Dicision	Ø	Height
21034	10 ml	0.2 ml	16 mm	140 mm
21035	25 ml	0.5 ml	50 mm	169 mm
21036	50 ml	1.0 ml	55 mm	199 mm
21037	100 ml	1.0 ml	65 mm	260 mm
21038	250 ml	2.0 ml	75 mm	315 mm
21039	500 ml	5.0 ml	95 mm	350 mm
21033	1000 ml	10.0 ml	125 mm	415 mm

Deioniser

Small and compact, the pressureless plastic cartridge provides with demineralized water of the same quality as large ion exchangers. Ideal for small laboratories or for the supply of autoclaves up to a daily requirement of 10 liters. **Economic:** 100% capacity utilization due to special water supply. **Safe:** thanks to consistently good water quality without losses due to storage. **Environmentally friendly:** due to the long service life of the resins and almost unlimited regenerative ability.

Delivery contents: incl. demineralisation cartridge, hose set and wall bracket.

Technical data	
Installation	Wall unit with integrated holder
Display	analogue conductivity meter control
Output	50 l/h
Capacity	425 l
Quality	0.1-20 µS/cm
Dimensions	(Ø x height) 100 x 600 mm
Weight	3 kg

Item-no.	
21030	Deioniser
21031	Replacement cartridge

Muffle Furnace

Compact, lightweight muffle furnace for many laboratory applications. The furnace has a double-walled, stainless steel plate structure for low external temperatures and high stability.

• Protected heating elements in quartz glass tubes. Energy-saving insulation
• Supply air opening adjustable
• Low-noise high-power relay
• Adjustable heating ramp and hold time
• Integrated over-temperature monitoring

Technical data	
Max. temperature	1100 °C
Volume	6 l
Weight	18 kg
Electric power	1800 W
Supply voltage	230 V
Inner dimensions	170 x 200 x 170 mm
Outer dimensions	510 x 400 x 320 mm

Item-no.	
21060	Muffle furnace

Digital Spoon Balance

NEW

Practical balance for fast measuring on site, e.g. fertilizer or plant protection products.

Delivery contents: digital spoon balance, spoon, battery, manual.

Technical data	
Capacity	0 - 300 g
Resolution	0.1 g
Tare-function	full weighing range
Spoon volume	28.4 ml
Display	LCD display
Housing	ABS
Battery	1 x CR2032
Dimensions	160 x 30 x 20 mm
Weight	113 g

Item-no.	
43025	Spoon balance

Pocket Balance

- Compact, affordable electronic precision balance
- Electronic-sensor based weighing technology
- Useful tara weight function

Technical data	
Capacity	500 g
Resolution	0.1 g
Weighing modes	g/oz/gn/ct
Battery	1 x CR2032 (included)
Dimensions	115 × 78 × 16 mm

Item-no.	
43031	Pocket balance

Solar Scale

- Top solar technique
- Shock-proof plastic material
- Automatic switch-off
- Automatic zero-positioning
- HOLD-function to freeze the displayed weight
- Optional **stainless steel platform** (robust and protective, easy to clean, Ø 150 mm)

Technical data	
Capacity	2000 g
Resolution	0.5 g (0 - 100 g) / 1.0 g (100 - 2000 g)
Dimensions	196 x 130 x 65 mm

Item-no.	
43020	Solar-scale
43021	Stainless steel platform

Electronical Balance "Steel"

- Brushed stainless steel platform and shock-proof plastic material case
- Tare-function
- Automatic switch-off
- Automatic zero-positioning
- Weight value in g/lb/oz/ ml
- Incl. battery

Technical data	
Capacity	5000 g
Resolution	1 g
Minimum load	4 g
Platform	125 x 155 mm
Dimensions	135 x 205 x 14 mm
Battery	2 x 3V lithium battery CR2032

Item-no.	
43061	Balance "Steel", 5 kg

Precision Balance

420 g capacity

- Applications: Weighing, density determination, mole weighing
- Large display with backlight
- Stainless steel weighing platform
- Weight value in g / kg / lb / oz / ml
- Battery or power supply
- Stability indicator, low battery indicator, auto shut-off, auto tare, span calibration mass   included (only item.-no. 43043)
- Communication: RS232, USB Host, USB Device, Ethernet or Bluetooth® (option)

Item-no.	
43040	Capacity: 120 g, Resolution: 0.001 g
43042	Capacity: 420 g, Resolution: 0.1 g
43043	Capacity: 6200 g, Resolution: 0.1 g

Further models on request.

Analytical Balance

RS232 interface, integral weigh below hook, full housing in-use cover, removable stainless steel pan, die-cast metal bottom housing, security bracket, illuminated up-front level indicator, four adjustable feet, software lockout menus, stability indicator, software overload/underload indicators, user selectable environmental settings, audible indicator, user selectable brightness settings, auto dim, touch screen calibration, auto tare, user selectable 13 operating languages.

Technical data	
Capacity	420 g
Resolution	0.001 g
Minimum load	2 g

Item-no.	
43071	Analytical balance

Further models on request.

Magnifying glasses

Double Magnifying Glass

- With 2 lenses
- Magnification: 4 or 8-fold
- Lens diameter: 34 mm

Item-no.	
44010	Double pocket magnifying glass

Thread Counter

- Thread counter with soft case
- Housing: metal
- Lens: silicate glass
- Magnification: 8-fold
- Area: 25 x 25 mm, Height: 50 mm

Item-no.	
44020	Thread counter

Illuminated Magnifying Glass

- Illuminated magnifying glass
- Lens with antistatic coating
- Incl. battery
- Magnification: 10-fold

Item-no.	
44030	Illuminated magnifying glass

This article fits perfectly as a promotional gift for your customers. We will gladly create an individual offer for your logo printed.

More on promotional gifts offer

Microscope

Rod Type Microscope

Small, handy microscope with illumination

- Magnification: 40-fold

Delivery contents: microscope incl. battery and a soft case.

Item-no.	
44040	Rod type microscope

USB Microscope

The microscope shows objects in "live view" on the computer screen.

Eight LEDs illuminate best your research object from all sides and provide sharp and brilliant images.

- Magnification: from 50 to 1,000-fold
- Data transmission and power supply via USB 2.0
- Screen capture resolution 1280 x 1024 pxl
- Frame rate: 30 frames per second
- With image and video recording function
- With stand and software (Windows 7, 8, 10 and Mac 10.5 or later).

Item-no.	
44050	USB microscope

Stereo Zoom Microscope

Laboratory microscope for scientific applications with minimal maintenance. The microscope corresponds to the highest optical and mechanical standards and is made for daily use.

- Brightfield observation method for transmitted and incident light
- Greenough optical system

| Technical data	
Head	Trinocular, 360° rotating head
Eyepieces	WF 10×/21 mm
Working distance	100 mm
Illumination	EcoLED (incident and transmitted)
Battery	Ni-MH rechargeable batteries for up to 12 hours of working time
Dimensions	205 x 280 x 365 mm / 3.5 kg

Item-no.	
44060	Stereo zoom microscope
44061	Digital camera incl. adapter, software

Find out more

Smart lighting spectrometers

Find out more about light
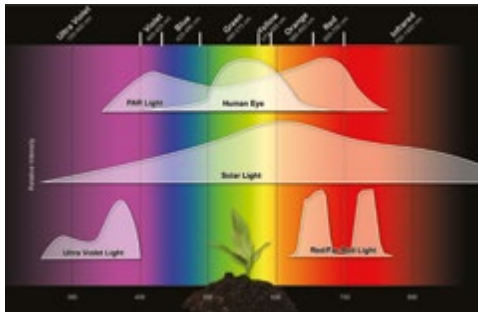
As the driving force for photosynthesis, light is fundamentally important for crop production. Plant growth and development is significantly influenced by both the quantity and the quality of light. Light energy is relevant to other factors, too. The ET calculation (evapotranspiration) for irrigation scheduling uses solar radiation as a key variable.

Lux meters measure light similar to how the human eye perceives brightness: strongest in the 500-600 nm range.

The light that drives photosynthesis in plants is Photosynthetically Active Radiation, or PAR light. Though PAR light ranges from 400 to 700nm, the region brightest to human eyes is the area of least effect on plants. Measuring quantum light can tell you if your plants get a sufficient amount of usable light.

Lighting spectrometer PRO Essence

The PRO Essence spectrometer is used in combination with a smartphone for measurement of different lighting parameters, depending on the respective applications.

• Integrated flicker meter
• Integrated temperature and humidity sensor
• 17 meas. parameters, e.g. Lux, PAR, IR
• Graphical indication of the results
• Very good repeatability

The operation via the smartphone app is very easy and without training immediately possible. After simple Bluetooth coupling, e.g. with your smartphone, you start one of the corresponding apps and can immediately analyze spectrum, flicker and other lighting parameters of the light source.

Delivery contents: lighting spectrometer PRO Essence, soft case, battery charger, stand for seperate use of sensor and your smart device.

Technical data	
Measuring range	100 – 50.000 Lux
Wavelength range	380-780 nm
Optical resolution	10 nm
Accuracy	± 0.003 (at 1000 LUX Standard Light Source)
Integration time	6 ms – 16 s
Measurement mode	• Single • Multiple • Subtract Background
Functions	• Automatically record temperature and humidity • Photo • Note • Auto connection (iOS) • Auto dark calibration • Data comparison • GPS orientation
App (iOS & Android)	• Spektrum Genius Essence (free) • Spectrum Genius Agricultural Lighting App (200,- €)
PC Software Standard (Windows 8,10,XP)	chargeable
Dimensions	68.5 x 17 x 56 mm
Weight	79 g

Item-no.	
32750	Lighting spectrometer PRO Essence

Further lighting spectrometers on request.

LUX measurement

PAR measurement

LUX Meter

• Small, easy to use
• Large, clearly readable LCD Display
• HOLD-button for highest and actual measuring value
• Incl. 12 V battery

Technical data	
Measuring range	0 - 200; 200 - 2,000; 2,000 - 20,000; 20,000 - 50,000 LUX
Accuracy	± 5% < 10,000 LUX ± 10% > 10,000 LUX
Resolution	0.1 LUX
Dimensions	188 x 64.5 x 24.5 mm 115 x 60 x 27 mm Photodetector
Weight	160 g

Item-no.	
32010	Light meter

LUX Multi Meter

Professional LUX Multi meter for measuring 4 different types of light: sunlight, fluorescent lamps, sodium and mercury discharge lamps.

• Measures light level in LUX or Fc over three ranges
• Large, clearly readable LCD Display
• Indication of minimum, maximum and average value, Zero-adjustment
• Incl. 9 V battery

Technical data	
Measuring range	0 - 100,000 LUX in 3 steps
Accuracy	± 5%
Max. humidity	80 % RH
Operation temp.	0 - 50 °C
Dimensions, weight	180 x 72 x 23 mm, 334 g

Item-no.	
32020	LUX Multi meter

Quantum PAR/DLI Light Meter

NEW

PAR- or Quantum meter measures the total amount of light which can be used by plants for photosynthesis.

This hand-held quantum meter provides accurate PAR light readings from any light source: Full sun to full shade indoors or outdoors; artificial light sources, incl. LED, High Pressure Sodium, Metal Halide, Florescent, Halogen, etc.). DLI mode shows Daily Light Integral on the LCD. According to the light source, the calibration is selectable (electric / solar).

The meter comes with manual and guideline values for different plants.

Technical data	
Measuring range	0 - 6.500 µmol/s*m^2
Resolution	1 µmol/s*m^2
Accuracy	±5 %

Item-no.	
32800	Quantum PAR/DLI Light Meter

T-Warner Weather Stations

For professional horti and agriculture

The weather station is used for early detection and warning, planning, control and management of complex meteorologically dependent processes.

With the automatic weather station T-Warner all relevant climate data such as air temperature, humidity, global radiation, precipitation, wind direction, speed, etc. are continuously measured and transferred to a secure Internet database.

All that is needed is an activated SIM card. Weather data is transmitted in real time via the Internet, clearly displayed in graphical or tabular form and can be exported. No additional software is required, the web browser is sufficient.

The T-Warner system enables warnings for frost, heat, heavy rain, etc. via SMS in real time.

The basic unit of the T-Warner station consists of a stainless steel carrier housing, a GSM modem with antenna and a solar panel with battery.

Power can be supplied via a 220V mains connection or, as standard, from batteries that are charged via a solar panel. This allows an absolutely free choice of location.

Owing to a wide range of sensors, each station can be configured individually.

Fields of operation:
- Measurement and documentation of microclimate data
- Frost alert for orchards, potatoes, vineyards
- Crop protection
- Plant diseases forecasts
- Irrigation control and management
- Recording of temperature sums, cold periods, etc.
- Temperature monitoring in the asparagus ridge
- Temperature monitoring and control in greenhouses, optional: several sensors on one chain
- Monitoring, documentation and control of light conditions in greenhouses (e.g. shading)
- Monitoring, control of temperature and humidity in storage rooms
- Fire alert
- Temperature monitoring for strawberries under shelter
- Temperature monitoring in silos and bulk stores

Planning tools and services

Weather Forecast

Plan your work week and better organize your day, reduce and optimize your management decisions.
- 14-days forecast outlook
- 3 or 7-days Hyper-Local weather forecast data and meteograms with hourly resolution
- Output hourly data for multiple forecast variables, including all the important agrometeorological variables, daily ET and more.

Irrigation Management

By using different sensor technologies for soil moisture measurements (tensiometers, WaterMark sensors, FDR sensors, etc.) and by taking into account the precipitation, the irrigation can be optimized and controlled in an intelligent way.

Frost Alert

The system provides a real-time warning function.

After individual temperature limit values are set, the station automatically sends SMS warnings to up to 16 stored mobile phone numbers if the values are exceeded or not reached.

This function can be used by several sensors at the same time and is of great importance for e.g. frost warning in fruit growing, viticulture etc.

Crop Protection

The information about air temperature and humidity, precipitation and leaf wetness allow very reliable forecasts of mostly common plant diseases.

The user of T- Warner stations has access to different plant disease forecast models, such as for: fire blight pears, botrytis cinerea, monilia laxa, alternaria, fusarium, etc.

The use of forecast models is charged at a special rate.

Disease forecast models on request.
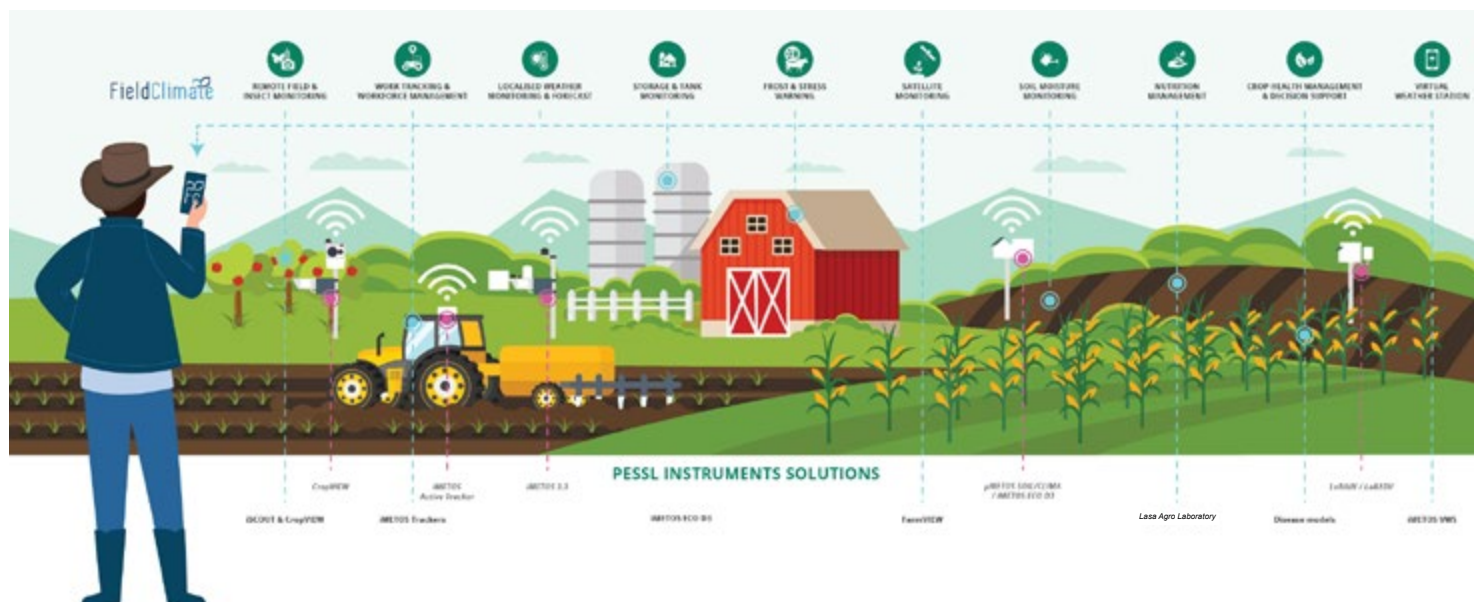
T-Warner System

A complete environmental monitoring system that has a solar panel as well as an internal battery and transmits weather data in real time via GSM / GPRS. T-Warner units are very robust and reliable weather stations for any needs in your field.

The data logger has a built-in UMTS/CDMA modem for direct communication with the FieldClimate platform, and can handle up to 600 sensors through the intelligent sensor bus system. The system is extremely reliable due to non-volatile internal memory and can store up to 8 MB of logged data (ca. 1 month).

The T-Warner Weather Station can also send SMS Alarms (user-defined via Internet) to alert you in cases od frost, strong rain, high temperature and more.

Data is regularly uploaded to FieldClimate platform where you can access it from any place at any time in real-time. Along with accessing the historical data and daily evapotranspiration values, you can also take advantage of decision support solutions like localised Weather Forecast, Disease Models and Irrigation Management.

Technical data	
Sensor-Layout	6 fixed analogue inputs: wind speed, leaf wetness and rain gauge
	5 digital inputs: automatic sensor recognition, supporting sensor chains (max. 600 sensors)
Memory	8MB flash memory
Internet Connectivity	GSM – GPRS, EDGE, HDSPA, CDMA, UMTS, Wi-Fi, Satellite
Alert	SMS, user configurable via website
Measuring interval	5 min
Logging interval	15 – 120 min (user selectable)
Internet contact	user selectable
Battery	6V, 4.5AH Operating range: -35°C to 80°C
Solar-Panel	1,4 Watt solar panel, dimensions: 135 × 135 mm
Dimensions without sensors	410 x 130 x 70 mm
Weight without sensors	2.2 kg

Item-no.	
TNS30	**T-Warner Basis:** GPRS-modem, solar panel with accumulator, stainless steel housing, without sensors

Model configuration examples
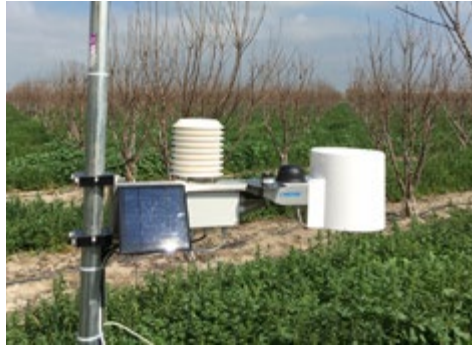
Item-no.	
IMT180	**T-Warner 180:** • temperature • air humidity • precipitation

Item-no.	
IMT200	**T-Warner 200:** • temperature • air humidity • leaf wetness • precipitation

Item-no.	
IMT300USW	**T-Warner 300USW:** • temperature • air humidity • leaf wetness • precipitation • global radiation • wind speed and wind direction

Naturally, all stations can be individually equipped with sensors.

All T-Warner stations can be configured according to the specific needs and desires of the user. We would be pleased to make an individual offer for you.

ECO Soil Moisture

Warner T-ECO Soil Moisture is a preconfigured wireless station, providing users from different specialist fields continuous and affordable soil moisture measurement. Particularly suitable for the T-Warner ECO Soil Moisture is for the following applications:

• Irrigation management
• Golf, sports and public green management
• Research, long-term soil moisture studies and environmental studies
• Soil and groundwater re-mediation
• Predictions in flood and landslides

The T-Warner ECO Station is powered by solar energy (alternatively 220 V mains voltage) and is equipped with a data logger and GPRS modem.

The sensor unit is wired through the box with the data logger. All data collected will be sent directly to the Internet platform. This guarantees the user a clear overview and transmission of all data in real time on any web-enabled device (PC, mobile phone, notebook, netbook, PDA). For the output data in graphical or tabular form, no special software is required.

Several soil moisture sensors can be connected to the station.

Item-no.	
ECOD3	Soil moisture monitoring station T-Warner ECO Soil Moisture, basic unit

Model configuration examples

Item-no.	
ECOD3-CLIMA80	**T-Warner ECO D3 CLIMA80:** • einfache Lufttemperatur • Regenmesser
ECOD3-CLIMA STEP	**T-Warner ECO D3 CLIMA180:** • einfache Lufttemperatur • Regenmesser • 2 x Watermark-Sensoren • internes Interface

The soil moisture measuring station can be customized individually.

IoT Weather Stations

µMETOS NB-IoT

µMETOS NB-IoT is a LPWAN weather station that operates on NB-IoT network (Narrowband Internet of Things), corresponding SIM-card required.

It is designed to monitor basic climate parameters (rain and temperature), soil characteristics (soil moisture, soil temperature and electrical conductivity), as well as water pressure. Data is consistently measured in 15-minute intervals and sent every 60 minutes to the server. All the data is synchronized with FieldClimate.

Fields of operation:
• Soil moisture monitoring and irrigation management
• Improving plant protection with disease models
• Frost monitoring & alarms
• Agriculture (crop growing), golf courses, parks, smart cities

Technical data	
Housing	UV resistant polycarbonate plastic (Protection class IP65)
Connectivity	NB-IoT Category: Cat-M1/NB1 Frequency Band: B1, B2, B3, B4, B5, B8, B9, B10, B12, B13, B14, B17, B18, B19, B20, B25, B26, B27, B28, B66
Battery	6V charging battery with solar panel
Solar panel	Dimensions: 13.5 x 13.5 cm, 2 Watt solar panel
Meas.interval	15 min
Logging interval	15 min
Communication interval	60 min
Dimensions	30 cm x 16 cm x 19 cm
Weight	1.6 kg

Item-no.	
µMETOS-C-NS-N	Basic µMETOS NB-IoT station with no physical sensors

Model configuration examples:

Item-no.	
µMETOS-C-FR-N	µMETOS FROST with wet and dry bulb temperature
µMETOS-C-FARM-N	µMETOS FARMING with rain gauge, air temperature, air humidity, leaf wetness and soil temperature
µMETOS-C-T-1-N	µMETOS TUNNEL with air temperature, air humidity, 1 x Watermark sensor, 1 x Pessl Instruments PI 54-A sensor

MiniMETOS SOIL

MiniMETOS SOIL is a combination of most essential sensors for irrigation and stress management.

It permanently measures soil temperature & volumetric water content (VWC) with Pessl Instruments Soil Moisture Sensor PI54-D and Watermark (soil moisture suction) in near real-time wherever you want. The installation of a logger can be completely underground (invisible); therefore, it is a perfect installation for golf courses, parks, home & garden, as well as in agriculture where vandalism and theft could be a problem.

The device is battery powered with an autonomy between 1 to 2 years, and provides actionable data, such as the exact amount of moisture and the soil temperature in each inch/cm of the measurement area, to help you plan the irrigation event and to warn you about possible stress points in a timely fashion.

Preparation of the irrigation box for the data logger

With MiniMETOS SOIL all the potential issues and stress events can be identified before they occur or become visible.

• Permanent measurement of the soil moisture and soil temperature at any of your locations
• Invisible, so it doesn't affect the workers and the aesthetic of location (golf course, park etc.)
• No solar panel needed as fully battery powered due latest power harvesting technology
• 1-2 years of battery autonomy and quick installation
• Cost-effective and durable
• Prevents possible vandalism

Technical data	
Housing:	UV resistant polycarbonate plastic (Protection class IP67)
Dimensions	15 x 12 9.5 cm
Weight	250 g
NB-IoT	Category: Cat-M1/NB1
Connectivit	Frequency Band: B1, B2, B3, B5, B8, B9, B10, B12, B13, B14, B17, B18, B19, B20, B25, B26, B27, B28, B66
Power supply	3.6V primary battery cell
Measuring interval	15 min
Logging interval	15 min
Communication interval	60 min
Sensors	1 x PI54-D (% volumetric capacitive soil moisture, soil temperature), 1x WaterMark (soil moisture suction)

Item-no.	
MINIMETOS	MiniMETOS SOIL

Installation on golf course

Laying the cable - inserting the sensors in the main turf root zone

Re-installing the lawn tiles to cover the sensors. 14 days later - "invisible"

Camera products

Sensors overview

Automatic Pheromone Trap

iSCOUT® is a combination of hardware and software solutions for remote monitoring of different pest insects. The iSCOUT® is an insect trap with integrated electronics and a sticky plate. Due to its low weight, it can be hung wherever in the field. In the field, the device is self-sufficient, as it is powered by a solar panel and a battery.

10 MP camera takes high-resolution pictures of the sticky plate within the iSCOUT® trap. Images are sent via LTE to an online platform where they are analyzed and counted with automatic pest detection framework, using AI and self-learning algorithms. All data from camera system and AI software is displayed online, on the FieldClimate platform.

Item-no.	
ISC-PH	iSCOUT® Pheromone
CAMERA-BASE	Control unit for camera products

Crop View Kamera

CropVIEW® is an agricultural information system, which periodically takes high resolution photos of farmland, research plots, crop canopies, orchards etc. Photos are automatically uploaded to FieldClimate platform, thus allowing a constant crop quality and yield control. The high resolution pictures enable checking seeds for germination, monitoring the effect of fertilizers and pesticides on crop development, and help decide whether a disease or pest already threatens profitability. Images can be viewed and analysed daily over time without any additional effort. The system operates with rechargeable battery and a solar panel all year round in most climatic zones.

Item-no.	
IMV30	T-Warner CropVIEW® Tele
CAMERA-BASE	Control unit for camera products

Air Temperature and Humidity

Technical data	
Sensor	Temperature: PT1000 1/3 Class B Humidity: ROTRONIC Hygromer® IN-1
Measuring range	-100 to +200 °C / 0 - 100% rh
Resolution	0.01 °C / 0.02 % rh
Accuracy	± 0.1 °C / 0.8 % rh f. m. v.

Item-no.	
A660611	Sensor for air temperature and humidity with convection cap

Frost Alert

Station for wet and dry temperature

Item-no.	
ECOD3-Frost	Frost Alert Station
IM505-E	Wet & Dry bulb temperature sensor

Soil Moisture und Temperature

Technical data	
WaterMark Sensor	
Sensor	WaterMark
Measuring range	0 - 200 cbar
Accuracy	± 5%
Soil Temperature Sensor	
Sensor	Stainless steel
Measuring range	-30 to +75°C
Resolution	0.1°C
Accuracy	± 0.5°C

Item-no.	
MD510SM	WaterMark Sensor, with 4.5 m cable
IM5041D	Soil temperature sensor

Rainfall Meter

Technical data	
Sensor	tipping bucket rain gauge
Range	max. 12 mm/min
Resolution	0.2 mm
Accuracy	± 5 %

Item-no.	
IM523	Rainfall meter

Global Radiation

Technical data	
Sensor	pyranometer (320 - 1100 nm)
Range	0 - 2,000 W/m² (resolution 1 W/m²)
Accuracy	± 5 %

Item-no.	
IM5069D	Global radiator with leveling and holder

Windspeed and Direction

Technical data	
Measuring range	0.12 – 40 m/s
Resolution	0.05 m/s / 1°
Output rate	1-10 min

Item-no.	
PI-USWM	Ultrasonic Wind Sensor: Windspeed and Direction

Leaf Wetness Sensor

Item-no.	
IM521CD	Leaf wetness sensor, incl. 5 m cable

Weather stations

Wireless Weather Station

The wireless weather station has a combination transmitter with three external sensors: a thermo-hygrometer transmitter for monitoring the outdoor temperature and humidity, a rain gauge that reliably informs you of rainfall and a wind meter for determining wind force at the installation site. The data is sent to the base station and displayed there.

In addition, an integrated electronic barometer measures the air pressure and based on the changes, the weather symbol provides a forecast for the upcoming weather. The current air pressure is displayed as an absolute and relative value, the course of the last 24 hours can be observed on a bar chart and thus make a more accurate picture of the weather.

Function:

- Combined sensor including temperature/humidity sensor, rain gauge and wind meter
- Wireless transmission (max. 100 m) of outdoor temperature and humidity, rainfall quantity and wind velocity
- Indication of indoor temperature and humidity
- Absolute and relative atmospheric pressure, weather forecast and atmospheric pressure trend, bar graph indication and history of the last 24 hours
- Windchill factor and dew point
- Max.-min.-function with time and date of recording
- Programmable alarm functions for certain weather conditions like temperature alarm, storm warning, etc.
- Radio-controlled clock with alarm and date, time zone ±12 hours
- Backlight

You also have the indoor temperature and humidity in view and can control the room climate with targeted heating and ventilation. The weather station offers many additional features and information. You can set alarm limits, retrieve highest and lowest readings with time and date of recording, calculate dew point and wind-chill temperatures.

Delivery contents:
base station, thermo-hygro transmitter, rain gauge, wind transmitter, batteries, instruction manual.

Technical data	
Temperature outdoor	-40 to +65°C
Temperature indoor	0 to +60°C
Humidity	10 - 99%
Maximum range	100 m
Transmission frequency	868 MHz
Clock	radio-controlled clock
Material	plastic
Batteries	3 x AA 1.5 V (base station) 2 x AA 1.5 V (T/H-transmitter)
Assembling	to be hung or freestanding
Dimensions	151 x 29 x 161 mm
Weight	294 g

Item-no.	
35270	Wireless weather station, complete

Rain monitor

Radio Controlled Rain Gauge

Transmission of outdoor temperature and rainfall quantity (max. 30 m) with temperature tendency, indication of total rainfall quantity, of the last hour, the last 24 hours and the last rain with time and date of recording, bar graph indication and history of the last 7 days, weeks and months, rain sensor with alarm, indication of indoor temperature, max.-min. function, adjustable temperature alarm, clock and date, measuring range temperature outdoor -50 to +70°C (-58 to +158°F), indoor -10 to +50°C (14 to +122°F), reversible °C/°F, rainfall 0 to 9999 mm (0 to 999.9 inch), for hanging and standing.

Delivery contents: outdoor rain gauge, transmitter, batteries 3 x 1.5 V AA for station, 2 x 1.5 V AA for transmitter.

Item-no.	
36010	Radio controlled rain gauge

Rain Meter, plastic

Rain meter, plastic green, in two types:

- With bar holder: 0-50 mm, transparent scale
- With integrated penetration rod: 0 - 35 mm, black scale

Graduation:
1 mm / m² rain = 1 liter / m²

This article fits perfectly as a promotional gift for your customers. We will gladly create an individual offer for your logo printed.

Item-no.	
36020	Rain meter with bar holder
36035	Rain meter with penetration rod

Prof. Hellmann Rain Meter

This special rain gauge was developed to minimize evaporation losses that may occur during hot weather.

Precipitation is measured with the inner measuring cylinder, which has indication scale from 0 to 25 mm. This scale indicates falling rain in liters per square meter of soil surface. Air exchange is minimal.
- Catchment area = 100 cm²
- Resolution: 1 mm/m²
- Measuring range: 1 - 25 mm/m²

Delivery contents:
rain meter, inner measuring cylinder.

Item-no.	
36040	Rain meter
36041	Inner measuring cylinder

USB data logger

USB Data Logger 184-H1 for Temperature and Humidity

The USB data logger 184-H1 monitores temperature and humidity levels during cold chain transportation. Its large, easy-to-read LCD display shows readouts in real time. Its LED status lights alert when specified limits have been exceeded.

Technical data	
Memory	64,000 measuring values
Meas. range	-20 to +70°C; 0 - 100% RH
Resolution	0.1°C; 0.1% RH
Accuracy	±0.5 °C (0 to +70 °C) ±1.8 % RH (5 to 80 %RH)
Measuring rate	1 min – 24 h
Battery type	lithium battery CR2450, 3V, exchangeable
Dimensions	44 x 12 x 97 mm

Item-no.	
34150	USB data logger 184-H1

Further data logger models on request. Please contact us.

Digital thermo-hygrometers

Thermo-Hygrometer T-625

The T-625 compact thermo-hygrometer has a humidity sensor which measures the air temperature and RH. It can also calculate the dew point and wet bulb temperature.
- Display shows min/max readings at the touch of a key
- HOLD-function that freezes the last reading
- Powers off automatically to conserve battery power
- 2 years warranty

Technical data	
Measuring range	-10 to +60 °C; 0 - 100 % RH
Accuracy	± 0.5 °C, ± 2.5 % RH
Resolution	0.1°C, 0.1 % RH
Housing	ABS, shockproof, IP54
Weight	195 g

Item-no.	
37138	Thermo-hygrometer T-625

Thermo-Hygrometer T-608-H1

Humidity/ Dew-point / Temperature measuring instrument incl. battery. The affordable and precise T-608-H1 hygrometer measures humidity, temperature and dew-point non-stop. Accurate measurements even in rooms with high air humidity - ideal for greenhouses.
- Dew-point calculation, max / min value display
- Humidity sensor unaffected by condensation - ideal for greenhouses
- Display easily legible at a distance

Technical data	
Measuring range	0 to +50 °C and 10 - 95 % RH
Accuracy	± 0.5 °C, ± 3 % RH
Dimensions	111 x 90 x 40 mm
Weight	168 g

Item-no.	
37146	Thermo-hygrometer T-608-H1

Thermo-Hygrometer with Data Logger Function

Indication of dew point, maximum and minimum values with time and date, alarm at exceeding of temperature and humidity. Data files via display or PC with USB interface, switching output, clock with battery 3 x 1.5 V AA, PC software, USB interface, connect up to 8 remote transmitters. Wireless outdoor thermo-hygro sensors are available as an option.

Applications: cooling and storage rooms, greenhouse, living rooms with danger of mold, etc.

Technical data	
Measuring range	outside -40 to +60 °C, inside 0 - 50 °C and 0 - 99 % RH
Accuracy	± 1 °C / ± 3 % RH
Memory	50.000 readings
Dimensions	137 x 98 x 26 mm

Item-no.	
37170	Thermo-hygrometer, basic unit
37171	Outdoor sensor

Indoor/Outdoor Thermo-Hygrometer

- Simultaneous reading of inside-/outside temperature and humidity
- Large, easily readable LCD-display
- Max./min. function for temperature in/out
- Max./min. function for humidity
- For hanging or standing
- Outdoor cable: about 1.5 m
- Incl. battery 1.5 Volt

Technical data	
Measuring range	-50 to +70 °C, 10 to 99 % RH
Resolution	0.1 °C, 1 % RH
Accuracy	± 0.1 °C, ± 3.5 % RH

Item-no.	
37140	Indoor/outdoor thermo-hygrometer

Thermo-Hygrometer

Analogue thermo hygrometer with synthetic hair to check the climate.

- Made in Germany
- To monitor the temperature and humidity
- Ideal for the greenhouse and conservatory
- Housing with brass bezel
- Synthetic-hair precision hygrometer

Technical data	
Measuring range	15 to +55°C, 0 to 100 %RH
Dimensions	Ø 100 mm
Weight	105 g

Item-no.	
37311	Thermo-hygrometer

Temperature Probe with digital display

NEW

With this temperature probe you can control the temperature curve of hay, grain, wood chips, compost and many other bulk goods in your warehouse. In case of warming up you can take any necessary corrective action promptly and thus prevent storage losses caused by insects and fungi.

The lance and the handle are made of stainless steel, temperature sensor, display and the wiring are protected inside the stainless steel tube.

The measuring tip is made of aluminium. This means that the temperature is transferred to the sensor more quickly and the measurement result can be read after a short time.

The probe measures up to +110°C and can therefore also be used in a critical time when deciding whether clearance efforts or fire-fighting measures should be carried out.

Delivery content: measuring instrument, battery, manual.

Technical data	
Lance	1,000 mm or 1,500 mm / Ø 16 mm
Housing material	lance and handle made of stainless steel
Measuring range	-50 to +110 °C
Accuracy	±1 °C
Display	built-in LCD display with 10mm digit height
Temp. sensor	in the lance tip
Battery type	1x LR44
Display	ongoing display of the measured value

Item-no.	
37417	Temperature probe with display, 1 m
37415	Temperature probe with display, 1.5 m

Further lengths on request.

175-T3 2-channel Thermo-Logger with 2 external sensors

The logger 175-T3 is a compact and small sized data logger, which measures temperature with a memory up to 1 million results. The logger provides immediately a quick overview of the current reading, the last value saved maximum and minimum value and the number of times the limit has been exceeded. The measurement data are retained even when the batteries are empty or when changing batteries. Data loss is almost impossible. Software for free download or chargeable as CD.

Application: temperature monitoring in compost. Recommendation of the German Association of Compost Producers for Quality Assurance of Compost in the FRG, in order to prove the hygenisation of compost.

Necessary accessories:
• Measuring sensors (see on the right)
• USB cable

Technical data	
Parameter	temperature (°C or °F)
Sensor	2 thermo elements (type K or T) external
Meas. range	-50°C to +1000°C (type K)
Resolution	0.1°C
Accuracy	±0.5°C internal / ±0.7% of reading
Applic. temp.	-20°C to +55°C
Storage temp.	-20°C to +55°C
Battery type	3 x Type AAA or Energizer L92 micro cell AAA
Battery lifetime	3 years (15 min. meas. interval)
Protection class	IP 65
Housing	ABS / PC
Measuring rate	10s to 24h (selectable)
Memory	1,000,000 readings
Interface	Mini-USB
Dimensions	89 x 53 x 27 mm
Weight	130 g

Item-no.	
34030	Data logger 175-T3
90072	Connecting cable Mini-USB to USB
99508	Test report

Temperature Measuring Sensors

Waterproof robust immersion / penetration probe made out of stainless steel, type K. Available in 3 different lengths: 120 mm, 1,000 mm and 1,500 mm.

Measuring range: -50°C to +1,000°C

Both 1,000 mm and 1,500 mm measuring probes are provided with 1 m cable. Other cable lengths on request.

Holders for 175-T3

When purchasing the data logger 175-T3 in combination with a measuring probe, there is a free holder on the measuring probe available.

Please let us know if you want a bracket and an optional installation.

Item-no.	
37411	Measuring sensor 12 cm
37412	Measuring sensor 1 m
37413	Measuring sensor 1.5 m

Digital thermometers for compost and substrate

High-quality Thermometer with TopSafe

The T-925 is a 1-channel temperature measuring Instrument T/C Type K for connection of fast and reliable thermocouple and/or radio probe (options).

- Continuous display of min/max values
- All data: current, frozen and min/max values can be printed out on site via the report printer (optional)
- Audible alarm (adjustable limit values)
- HOLD-button for freezing measurement values
- Large, backlit display
- TopSafe, the indestructible case, protects from dirt and impact

Delivery contents: T-925 thermometer, 9 V block battery, TopSafe, calibration protocol.

Technical data	
Storage temp.	-40 to +70°C
Appli. temp.	-20 to +50°C
Power	9 V-block battery 6F22
Housing	ABS
Dimensions	182 x 64 x 40 mm
Weight	171 g
Probe type K	
Measuring range	-50 to +1000 °C
Resolution	0.1 °C (-50 to +200°C) 1 °C remaining range
Accuracy	± (0.5 °C and 0.3% f.m.v.) -40 to +900°C ± (0.7 °C and 0.5% f.m.v.) remaining range

Item-no.	
37410	High-quality Thermometer with TopSafe
Necessary accessories	
37411	Measuring sensor 12 cm
37412	Measuring sensor 1 m
37413	Measuring sensor 1.5 m

Economy Thermometer

A reasonably-priced, precise, very fast digital thermometer. Sensor type K (NiCr-Ni).

Delivery contents:
economy thermometer incl. battery.

Technical data	
Measuring range	-50 to +750 °C
Power	9 V-block battery
Dimensions	210 x 70 x 24 mm
Weight	145 g

Item-no.	
37420	Economy Thermometer
Necessary accessories	
37411	Measuring sensor 12 cm
37412	Measuring sensor 1 m
37413	Measuring sensor 1.5 m

Gas Measurement

CO_2 - Temperature - Humidity Meter

The T-440, the efficient measuring instrument for measuring indoor air quality (CO_2, humidity and temperature).

The measuring technology ensures precise measurements even of high concentrations, e.g. in greenhouses.

- Clearly structured measurement menu for long-term measurement and parallel determination of CO_2 concentration, humidity and air temperature in indoor areas
- Absolute pressure compensation, calculation of wet bulb temperature, dew point and absolute humidity
- Wireless probe, internal data storage and USB port for data export
- The air velocity and IAQ measuring instrument can be expanded with a large portfolio of digital probes

Delivery contents:
T-444 basic unit, CO_2 probe with Bluetooth®, including temperature and humidity sensor (consisting of CO2 probe head and Bluetooth® handle); 4 x AA batteries, table stand and calibration protocol, case for testo 440 and 1 probe.

Technical data	
Basic unit	
Data transfer	BLUETOOTH®; USB
Battery	3 AA mignon 1.5 V
Dimensions	150 x 65 x 32 mm
Weight	250 g
CO_2 probe with Bluetooth®	
Probe length	130 mm, Ø30 mm
Battery	4 x type AA batteries
Data transfer	BLUETOOTH®
Radio range	20 m
Dimensions	295 x 50 x 40 mm
Weight	195 g
CO_2 measurement	
Measuring range	0 to 10000 ppm
Accuracy	±(50 ppm + 3%o.mv.) 0-5000 ppm ±(100ppm+5% o.mv.) > 5001 ppm
Resolution	1 ppm
Temperature and humidity measurement	
Measuring range	0 to +50 °C / 5 to 95 %RH
Accuracy	±0.5 °C / ±3 %RH
Resolution	0.1 °C / 0.1 %RH

Item-no.	
24015	T-440 measuring unit with CO_2 probe

AirCO$_2$ntrol 5000

NEW

The AirCO2ntrol 5000 is a CO2 monitor with data logger function via SD card. In addition to the CO2 levels, the device measures the temperature and humidity of the environment and informs you of the date and time. Clear chart of historical values (minute, hour, day, week). Max.-min.-function. Adjustable alarm. The stored data can then be easily evaluated via Microsoft Excel.

Delivery contents: CO_2-monitor, micro SD card, micro USB cable, instruction manual.

Technical data	
Range	0 - 5000 ppm / 5 - 95 % / 0 ... +50°C
Power supply	Micro USB
Data logger	1 million records as a CSV file on the micro SD card (included)
Dimensions	120 x 33 x 66 mm / 103 g

Item-no.	
24025	AirCO$_2$ntrol 5000

Digital Window Thermometer

Large display, maximum and minimum values with auto reset, weather resistant, adhesive film, simply fixed outside on the window – read off from inside.
Battery included (1.5 V AAA).

Technical data	
Measuring range	-25 to +70 °C
Dimensions	105 x 97 x 23 mm
Weight	110 g

Item-no.	
37145	Window thermometer

Minimum-Maximum Thermometer, digital

Weather-resistant plastic for indoor and out-door use. Incl. 1.5V AAA battery.

Technical data	
Measuring range	-20 to +70 °C
Dimensions	81 x 30 x 150 mm
Weight	81 g

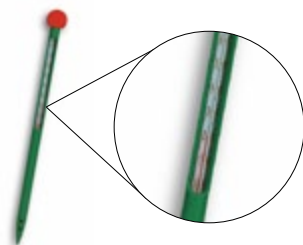| Item-no.	
37280	Minimum-Maximum thermometer, digital

Infrared Thermometer

Contact-free measuring of surface temperature. LCD display, HOLD-function, display of current, highest or lowest temperature. Incl. CR2032 battery.

Technical data	
Measuring range	-33 to +110 °C
Resolution	0.1 °C
Accuracy	± 2 %
Dimensions	68 x 37 x 17 mm, 31 g

Item-no.	
37120	Infrared Thermometer MINI FLASH

Soil Thermometer

Soil thermometer with green plastic housing.

Technical data	
Measuring range	-5 to +80 °C
Length	325 mm
Weight	80 g

Item-no.	
37460	Soil thermometer

Bimetallic Thermometer

Analogue stainless steel thermometer for compost, which allows you to control the temperature over time during the rotting process.

Technical data	
Measuring range	-10 °C to +90 °C
Probe length	40 cm
Diameter work	Ø 51 mm
Dimensions	51 × 51 × 410 mm, 46 g

Item-no.	
37456	Bimetallic thermometer

Infrared Thermometer RAY

NEW

For contact-free measurement of the surface temperature with laser sight. Ratio of measuring distance/spot 12:1. LCD display, HOLD function, display of the maximum temperature.

Technical data	
Measuring range	-50 to +500 °C
Battery	2 x 1.5V AAA
Accuracy	±1.5 to ± 3 %
Dimensions	39 x 110 x 144 mm, 144 g

Item-no.	
37110	Infrared Thermometer RAY

Insertion Thermometer, analogue

Insertion thermometer with protective case.

Technical data	
Measuring range	-10 to +100 °C
Resolution	0,1 .C
Probe length	120 mm
Dimensions	125 x 27 mm

Item-no.	
37451	Insertion thermometer, analogue

Insertion Thermometer

Electronic piercing thermometer with long sensor (180 mm), moving head (180°), HOLD-function, minimum / maximum function.

Incl. batteries and storage tube.

Technical data	
Measuring range	-40 to +200 °C
Resolution	0.1 °C
Accuracy	± 1 °C
Sensor length	180 mm

Item-no.	
37440	Insertion thermometer

Professional Thermometer

Digital thermometer with sensor (NTC), 110 mm and cable length of 60 cm. HOLD-function, Maximum/Minimum function, water-proof. Applications: temperature measurements of soil, food, fruits, plants and liquids.

Technical data	
Range	-40 to +200 °C
Resolution	0.1 °C
Accuracy	±1°C (-25...+150°C), otherwise ±1.5°C

Item-no.	
37430	Professional thermometer

Ethylene measurement

Fruit quality

Mobile Ethylene Analyser

The Mobile Gas Analyzer F-950 measures levels of Ethylene, CO2, and O2 to maintain optimal produce quality at every phase of the supply chain.

- Fast, precise and cost-effective analysis
- Displays results in under 30 seconds
- Past records stored on the device
- Hand-held and lightweight
- Battery lasts for 8+ hours
- Display easily viewed in dimly lit environments
- water filter for removing non-ethylene hydrocarbons

The F-950's versatile design allows it to be scaled to many environments, from cold storage to transportation container. The F-950 is ideal for measuring ethylene production across a wide range of fruit types.

Uses:
- controlled atmosphere storage facility management
- verification of ethylene mitigation systems
- precision citrus degreening
- headspace sampling for Modified Atmosphere Packaging (MAP) quality assurance

Delivery contents: F-950 Mobile Ethylene Analyser, hard-sided carrying case, two sets of batteries, charger, removable SD card and several accessory parts. Included accessories: sampling port with needle for taking non-destructive samples from packaging, Closed-Loop Probe used for sampling from Jars, Potassium Permanganate Filter (KMnO4), PolarCept water filter for removing non-ethylene hydrocarbons.

Technical data			
Sensors	C_2H_4	CO_2	O_2
Range	0 - 200 ppm	0 - 100%	0 - 100%
Resolution	0.1 ppm	0.01%	0.1%
Accuracy	5%	3%	2%
Housing	heavy-duty anodized aluminum		
Display	sunlight visible transflective LCD		
PC interface	USB, WI-FI SD card + Bluetooth		
Data recorded	Ethylene, CO_2 and O_2 concentrations, date, time, RH, GPS location		
Power source	removable rechargeable lithium-ion battery		
Dimensions	180 x 135 x 55 mm / 0.95 kg		

Item-no.	
24070	Mobile Gas Analyser

Food Scanner

The F-750 Food Scanner for fruit quality measurement analyses the product quality of plant foods through near-infrared spectral analysis (NIRS) in a quick and non-destructive way.

This measuring method is already used in many industrial applications for material testing and is also suitable for swift deployment of the various stages of the plant value chain. In many experiments, e.g. for tomatoes, grapes, mangoes and blueberries, a very good correlation has been stated between e.g. the Brix value (sugar content) and the NIRS value.

The correlation to other quality parameters required for predictive models, for example, like dry matter content, acidity or hardness, must be determined by tests.

F-750 allows creating of own models and its adapting for the respective field of application. The non-destructive prediction of the current ripeness degree and the estimated shelf life can help to prevent future food losses in the fruit and vegetables business, since alternative methods of utilization can be taken early in case of insufficient quality.

Technical data	
Spectrometer	Carl Zeiss MMS-1 spectrometer
Measuring range	310-1100 nm
Spectral sample size	3 nm
Spectral resolution	8-13 nm
Light source	Xenon Tungsten Lamp
Lens	glass, coated to enhance NIR
Display	transflective LCD screen
PC interface	USB and Wi-Fi SD card
Data recorded with each measurement	raw data, reflectance, absorbance, first derivative absorbance, second derivative absorbance
Power source	removable 3100 milliamp hour lithium-ion battery
Battery life	1600+ measurements
Data storage	removable 16 GB Wi-Fi SD card
Housing	heavy-duty anodized aluminum body
Dimensions	180 x 135 x 55 mm
Weight	1 kg

Item-no.	
26010	Food Scanner F-750

Avocado Scanner

The F-751 Avocado Quality Meter precisely and non-destructively measures dry matter, the avocado's key quality and ripeness indicator. Using near infrared (NIR) technology, the F-751 enables growers to accurately predict crop harvest dates, increase harvest predictability and get to market sooner.

Technical data	
Measurement	dry matter
Spectrometer	Hamamatsu C11708MA
Range	640-1050 nm
Spectral sample size	2.3 nm
PC interface	Wi-Fi
Power source	removable 3400 milliamp hour lithium-ion batteries
Battery life	500+ measurements
Dimensions	180 x 135 x 55 mm / 1.05 kg

Item-no.	
26011	Food Scanner F-751-Avo

Mango Scanner

Using NIR technology, the Mango Quality Meter precisely and non-destructively measures dry matter and Brix, the mango's key quality and ripeness indicators. This enables growers to accurately predict crop harvest dates, reduce guesswork and minimize spoilage, while increasing harvest predictability.

Technical data	
Measurement	dry matter & Brix
Spectrometer	Hamamatsu C11708MA
Range	640-1050 nm
Spectral sample size	2.3 nm
PC interface	Wi-Fi
Power source	removable 3400 milliamp hour lithium-ion batteries
Battery life	500+ measurements
Dimensions	180 x 135 x 55 mm
Weight	1.05 kg

Item-no.	
26012	Food Scanner F-751-Mango

Fruit sugar content

Fruit diameter

Refractometer

This Portable Refractometer is designed for quick and accurate sugar content measurements (BRIX) of wine, fruits, vegetables, juices, food, drinks, etc. It features 3 evaluation scales (Oechsle, Brix, KMW Babo) and an automatic temperature compensation (ATC). This makes it a universal and easy- to-use instrument for in-field analyses of sugar content.

Technical data	
Measuring range	0 - 140°Oe / 0 - 25°KMW Babo / 0 - 32% Brix
Resolution	1°Oe / 0.2°KMW Babo / 0.1% Brix
Accuracy	± 1°Oe / ± 0.2 KMW Babo

Refractometers for honey and frost protection with adapted measuring ranges are also available.

Item-no.	
25010	Refractometer
25011	Refractometer for anti-freezers
25012	Refractometer for honey

Digital Refractometer

Economic portable refractometer. Easy-to-use, fast, accurate. Standard ATC (automatic temperature compensation). Dual temperature. Alarm of low voltage. Automatic power management. Water resistant. Indication of 4 units: MASS S/W (sugar concentration), VOL AP, Oechsle (German unit) and KMW (Klosterneuburger Most Weight). Calibration with distilled water possible. Automatic switch-off after 3 minutes. Delivery incl. 9V battery and storage case.

Technical data	
Measuring range	0 - 50% Brix / 0 - 230°Oe / 0-42°KMW / 0 - 80°C / 32 - 175°F
Resolution	0.1% Brix / 0.1°C / 0.1°F
Accuracy	± 0.2 % Brix / ± 0.3°C / ± 0.5°F
Light source	yellow LED
Sample	100 µl

Item-no.	
25020	Digital refractometer

Fruit Callipers

Item-no.	
45010	Aluminium calliper for big fruits, 13 ring,Ø 30-90 mm, graduation 5 mm
45015	Aluminium calliper for small fruits, 13 ring,Ø 15-28 mm, graduation 1 mm
45016	Plastic calliper for big fruits, 8 ring,Ø 55-90 mm, graduation 5 mm
45017	Plastic calliper for small fruits, 9 ring,Ø 16-32 mm, graduation 2 mm

Universal Calliper

Flexible fruit calliper for measuring all fruits with diameter of 32 mm to 100 mm.

Item-no.	
45020	Universal calliper, in a bag

Fruit maturity

Fruit diameter

Fruit Hardness Tester

The instrument provides an accurate guide to determining the right period for fruit harvesting and monitors maturation progress during cold storage (pulp softening).

- 2 tips: 8 mm and 11 mm
  (0.5 cm^2 area and 1 cm^2 area)
- Application: used to judge fruits' maturity by testing hardness of fruit such as apple, pear, mango, citrus fruits and so on.

Delivery contents:
fruit penetrometer, 2 tips, hard box.

Technical data	
Measuring range	big tip (11 mm): 0.5–12 kg/cm^2 / small tip (8 mm): 1–24 kg/cm^2
Resolution	0.1 (11 mm tip) / 0.2 (8 mm tip)
Inserting depth of pressure head	10 mm
Dimensions	140 x 60 x 30 mm / 300 g

Item-no.	
41030	Fruit hardness tester

Digital Fruit Hardness Tester

The fruit penetrometer, also called fruit hardness tester, is used to measure the hardness of most kinds of fruits such as apple, pear, strawberry, grape, large/hard fruits, small/soft fruits. It is applied during the harvest storage, the product transportation and the processing of fruits. **Functions:** Tension & compression (push & pull), zero, normal force, peak hold (max. load).

Technical data	
Measuring range	0.1 - 20 kg
Resolution	0.01 kg
Accuracy	± 0.5 kg at 23°C
Tip size	4 tips: 3 mm, 6 mm, 8 mm und 11 mm
Battery	6 x 1.5 V batteries

Item-no.	
41050	Digital fruit hardness tester
41051	Tripod
41052	Software for PC
41053	USB Interface cable

Potato Calliper

11 callipers made of aluminium for the determination of potato size. With size markers.

Gradation in steps of 5 mm, 30-80 mm.

Item-no.	
45018	Potato calliper

Asparagus Calliper

Asparagus calliper made of white plastic.
- 7 notches for diameter (6, 8, 10, 12, 16, 20, 26 mm) of asparagus spears
- 4 marks for length (12, 17, 22, 27 cm) of asparagus spears

Item-no.	
45019	Asparagus calliper

Infrared Refractometer

Non-destructive express measurement of sugar content

This new generation of refractometers allows fast non-destructive measurement of sugar content in fruits without cutting or squeezing.

Infrared measurement in a defined wavelength range is an established testing system in many other industrial applications. The measurement is made simply by placing the measuring optics on the surface of the fruit.

It requires no more cumbersome wiping and cleansing after each measurement, as with conventional analogue or digital refractometers.

Due to the preset calibration and different measuring ranges, a separate device is required for each type of fruit.

Many measurements can be carried out rapidly in order to receive a representative average result.

Following models are available:

apple, grape, asian pear, mango, peach, persimmon, corn, strawberry, prune, cherry, cherry tomatoes.

Technical data	
Measuring range (depends on model)	apple: 10 - 18% Brix peach: 8 - 20% Brix grape: 10 - 25% Brix pear: 10 - 16% Brix mango: 10 - 22% Brix
Resolution	0.1% Brix
Accuracy	±1% Brix (fruit varieties and measurement environment may affect accuracy)
Measurement temperature	+5 °C bis +35 °C (acclimate fruit to ambient temperature first)
t° compensation	automatic at +5 °C to +35 °C
Battery	2 × AAA alkaline batteries
Protection class	IP64
Dimensions	61 x 44 x 115 mm
Weight	120 g (basic unit)

More information on our website

Item-no.	
25030	IR Brix Meter for apples
25031	IR Brix Meter for grapes
25032	IR Brix Meter for peaches
25033	IR Brix Meter for pears
25034	IR Brix Meter for mangos

Further models on request

Fruit acid	pH measurement	Colour measurement

Brix Acidity Meter

- Easy and fast measurement of acid and sugar content of food products
- Optical measuring method without reagents
- Compact hand-held design

Technical data	
Measuring range	Brix : 0 – 60% Acidity : Citrus (low content): 0.1 – 4% Citrus (high content): 2.5 – 8.8% Grapes: 0.1 – 4% Tomato: 0.1 – 3% Strawberry: 0.1 – 3.5% Blueberry: 0.1 – 4%
Resolution	Brix : ± 0.1% / Acidity :± 0.01%
Accuracy	Brix: ±0.2% Acidity :±0.1% (0.1 to 1%)
Sample volume	min. 0.2 ml
Battery	2 x AAA alkaline batteries
Protection class	IP65
Dimensions	55 x31 x109 mm / 100 g (basic unit)

Item-no.	
25050	Brix Acidity Meter

pH Meter for Juice

NEW

The pocket pH meter for a wide range of applications: from drinking water and fruit juice to cleaning solutions and cooling lubricants.

Its splash-proof housing makes the pH meter suitable for outdoor and industrial use. The measurement data stored in the device can be easily transferred wirelessly to a PC via NFC.

Technical data	
Range	0 - 14 pH
Resolution	0.01 pH
Accuracy	± 0.1 pH
Sample volume	min. 0.6 ml
Calibration	at 3 points (4.01 / 6.86 / 9.18)
Battery	2 x AAA alkaline battery
Protection class	Waterproof IP65
Dimensions	55x31x109 mm / 100 g (basic unit)

Item-no.	
25060	pH meter for juices

Colour Charts

NEW

For visual colour valuation of the product quality.

The colours of the products are visually assessed by holding the colour palette against the products.

Item-no.	
45030	Apple Colour Chart ((Fuji, Tentation, Pink Lady, Gala or Golden Delicious)
45031	Cherry Colour Chart incl. calibre template from 22 mm to 34 mm diameter
45032	Tomato Colour Chart

Further colour charts on request

Complete phyto-monitoring system

Photosynthesis Monitor

Why to monitor photosynthesis?

Photosynthesis is not merely a chemical reaction turning the light, water and CO_2 into organic matter. Photosynthesis is also a key to the crop production and optimal use of resources, photosynthesis rate is an indicator of plant's well-being, growth and productivity. By constant monitoring of photosynthesis it is possible to optimize for the maximum yield almost any controllable plant growing parameters, the most common of which are:

- Open fields and orchards: irrigation and application of fertilizers;
- Greenhouses: light intensity, CO_2 concentration, air temperature and many more.

Why Photosynthesis Monitor?

Unlike other systems in the market, the Photosynthesis Monitor does not make one (or two, or five) photosynthesis measurements on a plant, but instead it provides a continuous monitoring of plant's photosynthesis on 24/7 basis during a week or a month or whatever time is needed for adjustment and fine-tuning of the growing conditions.

Is it only photosynthesis?

Along with photosynthesis, the Monitor is monitoring simultaneously many other essential parameters:

- Net photosynthesis, gross photosynthesis, photorespiration, dark respiration
- Leaf transpiration
- Stomatal conductance
- Photosynthetically active radiation
- Air temperature
- Air humidity
- Ambient CO_2 concentration in the air
- Atmospheric pressure
- Leaf wetness
- Leaf temperature

In addition, simultaneous monitoring from up to eight (out of tens) optional sensors can be done. They include:

- Sap flow
- Stem diameter
- Fruit growth
- Soil moisture
- Soil temperature
- Soil EC
- Auxanometer
- Pyranometer
- Quantum sensor
- etc.

Thus, the Photosynthesis Monitor is a true state-of-theart system for long-term automatic recording of many physiological characteristics on intact plants.

How does it work?

The Photosynthesis Monitor is connected to 4 original automatic self-clamping leaf chambers. The chambers are normally open; they close on the leaf for only 30 seconds one-by-one to take readings of both CO_2 and H_2O exchange rates. The short measurement time provides minimal disturbance to the leaf's natural state. A sampling rate for the fully automatic continuous operation can be adjusted within 5 to 120 minutes. During each sampling all the data from all other sensors are stored in the Monitor memory as well.

How can the automatically collected data be used?

The data are downloaded to a computer via USB wireless adaptor for further analysis. Then the data in CSV format can be analyzed by using provided graphical data viewer or any other relevant software. It can also be automatically interpreted, using an expert system or, for example, specialized comments and advise of orchard management specialists.
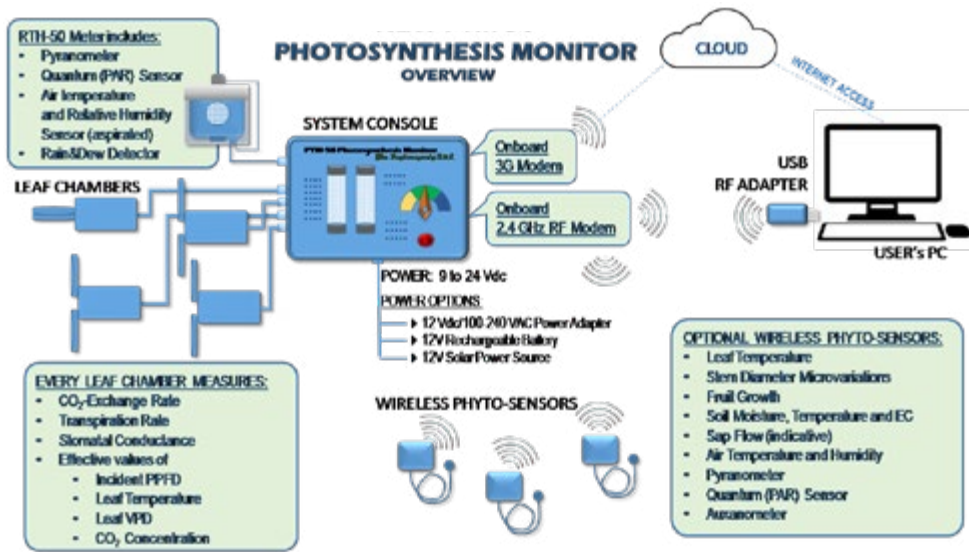
System Unit

Leaf Chamber

Sap Flow Sensors

Complete phyto-monitoring system

Technical data	
Mode of operation	continuous automatic
Number of leaf chambers	2 (min.) to 4 (max.)
Type of leaf chamber	motorized, normally open
Leaf chamber sampling mode	sequential
Chamber measurement cycle duration	about 20 s
Sampling time interval	5 to 120 min, user-defined
Leaf chamber aperture	10 cm²
Standard hose length and inner diameter	4 m, ID=2.4 mm
CO_2 measurement principle	non-dispersive infrared analyzer
CO_2 concentration measurement range	0 to 1000 ppm
Measurement range of CO2 exchange	-70 to 70 µmolCO2m-2s-1
H20 measurement principle	integrated air temperature and humidity sensor
Air flow control rates	adaptive, from 0.25 LPM to 0.5 LPM,
Power requirements	9 to 24 Vdc
Interface	• built-in 2.4 Ghz RF modem with the USB RF adapter for PC • optional 3G modem
Operating temperature	10 to 40 °C
Environmental protection index	IP55

What are the tasks the Photosynthesis Monitor can handle?

The typical for the protected crop tasks include:

• Optimization of a supplementary lighting, based on daily light curve of photosynthesis.
• The cost of electricity can also be accounted for, when determining the thresholds for turning on the lamps.
• Comparison of various light sources and their space distribution.
• Adjustment of CO_2 enrichment.
• Adjustment of air temperature.
• Effect of nutrition.
• Effect of ventilation.
• Effect of shading.
• Comparison of various plant species productivity.
• Distribution of plant productivity inside the canopy.
• Effect of fruit load, picking and harvesting.

Typical for both protected and unprotected crops tasks include:

• Transpiration monitoring for correction of the daytime and night-time irrigation schedule.
• Simultaneous monitoring of CO_2 and H_2O exchange to reveal the stomatal limitation of photosynthesis related to a water stress.
• Effect of fertilization on productivity.
• Detection of insufficient watering at nighttime, due to a common underestimation of nighttime transpiration in arid and semi-arid climatic zones.
• Control of the fruit growth when a standard size is required at harvesting.

Typical basic set for ordering:

• 1 x system unit
• 1 x AC/DC power adapter
• 1 x USB communication adapter
• 1 x RTH-50 Meter with the pyranometer, quantum (PAR) sensor, air temperature, air relative humidity, rain & dew sensors
• 4 x leaf chamber
• 4 x cable/hose duct for connecting leaf chambers (3.5 m)
• 2 x stainless steel tripod (1.5 m)
• optional wireless phyto-sensors
• 1 x container with CO_2 absorber
• software (English, Windows)
• user's manual (English)
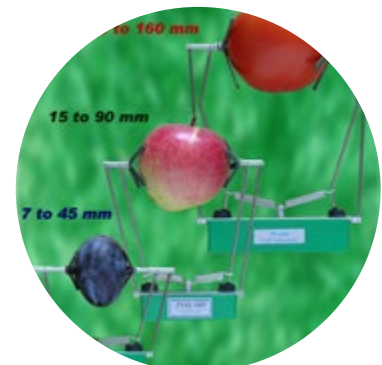
Phyto-Monitoring System in 30 sec

Item-no.	
27000	Photosynthesis Monitor

Leaf Temperature Sensor

Stem Micro-Variation Sensors

Fruit Growth Sensors

Save resources – optimize yields

SWM 5000

SWM 5000 is the automated monitoring system for efficient irrigation management.

Measuring system

The measuring principle of the SWM 5000 is based on the latest FDR technology (Frequent Domain Reflectometry). It enables fast and precise determination of soil moisture. Temperature is measured by an internal NTC sensor. The central hardware component is a robust stainless steel measuring probe, which is hydraulically or manually pressed into the ground. Measuring sensors are located in the probe tip during manual measurement.

Application:

The SWM 5000 soil moisture lance has been designed as stand-alone unit (handheld meter and measuring probe). The SWM 5000 system is conveniently controlled via smartphone app.


Evaluation & Irrigation Management

After measuring the soil moisture in different places, the readings are evaluated through an app and a recommendation of the required irrigation amount is issued.

The sampled fields can be created as a GPS card and stored with specific properties (relief maps, inhomogeneous floor sections, etc.).

These properties are then taken into account during calculation of the area specific irrigation quantities.
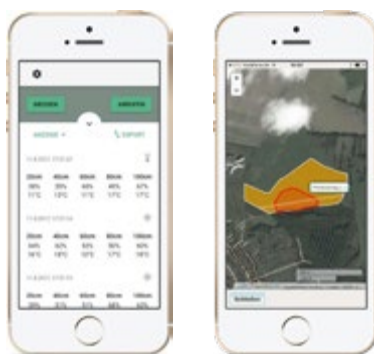
The app „SWM Companion" is available for both iOS and Android. It can be downloaded for free in the App Store and installed on the smartphone. Data transfer is wireless via Bluetooth.

App SWM Companion

Technical Data		
	Temperature	Moisture
Unit	°C	%WVC
Measuring range	0°C to +60°C	0 - 50 %WVC
Resolution	0.1 °C	0.1%
Accuracy	± 0.5°C	± 5% of mv
Temp. range		-20°C to +80°C
Measurement method	NTC	FDR
Calibration	not necessary (sensor internally)	via software for 0%: against air 50%: in water
Housing	splash-proof, IP40	
Working temp.	0°C to +40°C	
Display	54 x 32 mm; 128 x 64 Pixel	
Input	5-pin DIN socket	
Battery	9 V battery	
Measuring time	2 s for moisture and temperature	
Data memory	approx. 3440 measured values	
Measuring cycle	adjustable from 1 min to 24 hours	
Mobile phone operation	with the app "SWM Companion" (Android, iOS)	
Phone connection	via Bluetooth 4.2 (2.4 GHz)	
Languages	German, English, Russian	
Dimensions	83 x 180 x 55 mm	
Weight	330 g (basic unit)	
Probe		
Dimensions	length 1000 mm / Ø 20mm / 100 mm markings for the insertion depth	
Sensor	1 x temperature / 1 x soil moisture / 9 cm away from the insertion tip	
Probe	stainless steel tube with handle and attachment for measuring unit	
Weight	1.65 kg (probe with holder)	

Video HOW-TO-USE

Item-no.	
40910	SWM 5000 with probe

FDR / TDR soil moisture measurement

MST 5000

The hand-held meter MST 5000 provides a fast and precise determination of the volumetric soil moisture and soil temperature and can be used for direct, selective measurements in all soils and substrates.

The measuring principle is based on the FDR (Frequent Domain Reflectometry) technology and enables an objective measurement, only negligibly influenced by other chemical soil parameters such as pH and salinity. With this measuring method, it is important to note that the same results can only be achieved under the same environmental conditions (soil density, penetration depth) of the sensor. We recommend therefore to make several measurements and calculate an average.

Easy handling, immediate and direct display of the measured values in %VWC moisture, °C temperature are the outstanding properties of the measuring system.

Areas of application: growing media, directly in containers, pots and grow bags, indoor greenery, outdoors in mineral soils, experimental procedures, etc.

Delivery contents: COMBI MST 5000 basic unit, soil moisture probe, manual, transport and storage case.

Technical data	
Housing	splash-proof, rugged
Power	9-Volt-battery
Display	alphanumeric, reflective
Connector	8-pin-plug
Dimensions	180 x 83 x 55 mm
Weight	300 g
Soil moisture probe	
Range	0 - 60 %VWC / -40… + 60°C
Accuracy	± 3% / ± 0.5°C
Resolution	0.1% / 0.1°C
Dimensions of the probe	H = 150 mm, Ø 60 mm
Application	humidity and temperature measurement directly in the soil or substrate

Item-no.	
10850	MST 5000, complete case
40821	Soil moisture probe

TDR-150
Soil Moisture Sensor

The TDR 150 is the ideal tool for quick, reliable, and convenient measurement. Whether you're in a field, greenhouse, or laboratory, the TDR 150 will provide the results you want. Based on the proven time-domain measurement technology, the portable TDR-150 accurately measures soil moisture across the full range of soil moisture conditions.
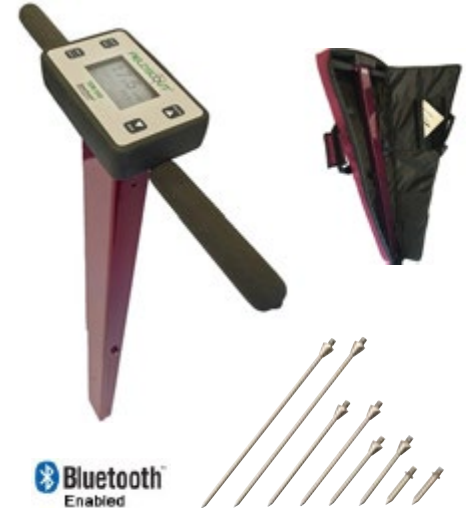
• Instantaneous readings of root zone soil moisture
• Measures EC and turf surface temperature
• Option to add on Bluetooth and GPS
• Data logger
• Industry exclusive backlit display
• Data collected with USB flash drive
• Ideal for measuring containers on benches
• Compatible with FieldScout App
• Optional IR Temp sensor

Delivery contents: soil moisture sensor TDR-150, 1 set rods, hard-sided case.

Technical data	
Measuring unit	% water content (volumetric)
Measuring range	0% to saturation (saturation up to about 50% volumetric water)
Accuracy	± 3 % volumetric water content
Power	4 AA batteries;
Length	3.8 cm, 7.5 cm, 12 cm or 20 cm
Sensor diameter	0.5 cm
Electrode spacing	3.3 cm
Data Logger	50,000 measurements
EC	Range: 0 to 5 mS/cm Resolution: 0.01 mS/cm, Accuracy: ±0.1 mS/cm
Temperature	Range: -30°C to 60°C Resolution: 0.1°C Accuracy: ±1°C

Item-no.	
40010	TDR-150 incl. 1 set rods (please specify the desired probe length when ordering)
40014	Additional rods 3.8 cm (1 pair)
40013	Additional rods 7.5 cm (1 pair)
40011	Additional rods 12 cm (1 pair)
40012	Additional rods 20 cm (1 pair)
40018	Fieldscout Bluetooth and GPS for TDR 150
40019	Annual licence for Field Scout Pro App (1-3 devices)

TDR-350
Soil Moisture Sensor

The TDR 350 accurately measures soil moisture across the full range of soil conditions. Improved ergonomic design provides quick and easy measurements.

• Instantaneous readings of root zone soil moisture
• Measures EC (Electrical Conductivity)
• Measures Turf Surface Temperature
• Integrated Bluetooth and GPS
• Data logger
• Industry exclusive backlit display
• Improved shaft-mounted probe with telescoping tubular frame
• Data collected with USB flash drive
• No PC interface needed
• Replacement probes
• Compatible with FieldScout App
• Optional IR Temp sensor to measure canopy

Delivery contents: TDR-350 unit, 1 set rods, soft-sided carrying case.

Technical data	
Measuring unit	% water content (volumetric)
Measuring range	0% to saturation (saturation up to about 50% volumetric water)
Accuracy	± 3 % volumetric water content
Power	4 AA batteries; approx. 100,000 readings without backlight
Length	3.8 cm, 7.5 cm, 12 cm or 20 cm
Sensor diameter	0.5 cm
Electrode spacing	3.3 cm
Data Logger	50,000 measurements
EC	Range: 0 to 5 mS/cm Resolution: 0.01 mS/cm, Accuracy: ±0.1 mS/cm
Temperature	Range: -30°C to 60°C Resolution: 0.1°C Accuracy: ±1°C

Item-no.	
40050	TDR-350 incl. 1 set rods (please specify the desired probe length when ordering)
40014	Additional rods 3.8 cm (1 pair)
40013	Additional rods 7.5 cm (1 pair)
40011	Additional rods 12 cm (1 pair)
40012	Additional rods 20 cm (1 pair)
40019	Annual licence for Field Scout Pro App (1-3 devices)

Soil moisture measurement by tensiometer

Soil water extraction

Tensiometer with analogue display

The classical method (vacuum gauge) is still the mostly used measuring. When the soil dries out, the water inside the tensiometer penetrates through the tip into the soil until the soil is saturated. The vacuum inside the tube increases and can be measured by the gauge. The common unit for tensiometric measurements is hectopascal (hPa) or millibar (mbar).

• A patented new plug-in connector
• Ensures highest reliability.
• Measuring range: 0-600 mbar

Item-no.	
40020	Tensiometer 30 cm, incl. analogue manometer
40030	Tensiometer 60 cm, incl. analogue manometer
40040	Tensiometer 100 cm, incl. analogue manometer

Tensiometer with digital display

• Easy-to-use: result can be read digitally with a push-button
• Battery for operation is needed (included)
• Automatic switch-off after 10 min
• Measuring range: 10 - 750 mbar/hPa

Item-no.	
40033	Tensiometer 33 cm, incl. digital manometer
40043	Tensiometer 43 cm, incl. digital manometer
40053	Tensiometer 53 cm, incl. digital manometer

Further lenghts on request.

Pore Water Samplers

Pore water samplers can be used alternatively to soil extraction for nutrient analysis and soil water sampling.

Attached syringe provides quick and easy soil water intake.

Application: analysis of soil water on pH, conductivity and nutrient levels.

The pore water samplers are available in lengths of 30, 60 and 90 cm.

Item-no.	
40403	Suction cup with syringe, 30 cm
40406	Suction cup with syringe, 60 cm
40409	Suction cup with syringe, 90 cm
40410	Vacuum Hand Pump
40411	Syringe for water extraction

Further soil moisture measurement

WaterMark

The watermark is composed of two sensor electrodes, which are embedded in a particular matrix material. The matrix has the same humidity as the surrounding ground. The moisture content of the matrix determines the resistance between the two electrodes. This resistance is converted from a reader in the driving potential. WaterMark handheld meter can read out any number of sensors. The result is displayed digitally from 0 (water saturated soil) to 200 (extremely dry) cbar. The soil temperature is adjustable in order to finetune the results.

• Measuring range 0-200 Centibar soil water potential
• Simple interpretation of data, regardless of the soil type
• Frost proof / maintenance free / very economic

Item-no.	
40710	WaterMark Basic hand-held display unit
40720	WaterMark sensor, 1.5 m cable

Moisture Tester for hobby growers

Simple, economic tester to check moisture in pots, balcony plants, etc. Only insert the tester in the soil and the needle immediately shows whether it is moist enough or not. Easy reading on the 1-10 ranging coloured scale.

No battery needed.

Ideal for resale in garden centers and flower shops.

Evaluation table for about 100 plants is included.

Item-no.	
40330	Soil moisture tester
40330-20	Soil moisture tester, box 20 pcs.
40330-200	Soil moisture tester, 10 boxes 20 pcs ch.

Combined Tester for hobby gardeners

Simple, inexpensive test device for the control of pH, moisture and light. Measure whether your plants have enough water and light, and if the ground is suitable for the particular plant. The tester is suitable for plant pots up to 35 cm in height. The tester is plugged into the soil and reacts immediately. Works without batteries or electricity!

Evaluation tables are included. Ideal for resale in garden centers, flower shops, hydro stores, etc.

Item-no.	
40335	Combined tester for hobby gardeners

Infrared moisture measurement

Material moisture

Infrared Moisture Analyser

The Moisture Analyzer is perfect for agricultural, chemical, environmental, food and beverage industries and many more. This fast, rugged analyzer provides the flexibility and accuracy required for a precise and fast moisture content determination.

With a large backlit LCD display, standard RS 232 port, 110g capacity with a readability of 0.01g/0.1% and an non-glass infrared heating element, the MB23 offers moisture analysis for any budget.

Simple to operate – set up and operation is extremely easy. Just press and hold the temperature or time buttons to set drying parameters, add your sample and begin the test process.

MB23 is very easy-to-clean to ensure the integrity of your samples and its compact design allows it to fit seamlessly into most workspaces.

- The backlit LCD display shows % moisture or % solids or weight (g), temperature, time
- Standard RS232 output for GLP printing and PC communications
- Optional: collect software

Technical data	
Capacity	110 g
Resolution	0.3% /(3 g sample) 0.2% /(10 g sample)
Graduation	0.1 g / 0.1 %
Sample size	3 g to 20 g typical, 0.5 g min.
Time setting	1 – 99 min, 30 s – steps to 60 min
Heating technology	infrared (no glass)
Temp. range	+50 to +160°C (5°C steps)
Display type	custom backlit LCD
Displays	% moisture or % solids or weight (g), temperature, time
Power	100 to 240 VAC, 50/60 Hz
Interface:	bidirectional RS-232
Pan size	Ø 90 mm
Dimensions	170 x 130 x 280 mm
Weight	2.3 kg

Item-no.	
21009	Infrared Moisture Analyser

Material Moisture Meter

Material moisture is displayed in percent by weight using stored material characteristic curves for wood and building materials. Accurate wood moisture measurement with stored characteristic curves for beech, spruce, larch, oak, pine, maple.

Delivery contents: material moisture meter, protective cap, batteries, calibration protocol.

Technical data	
Meas. range	0 - 90%
Accuracy	± 1% (conductivity)
Resolution	0.1%
Measuring time	0.5 s
Meas. principle	conductivity
Dimensions	119x46 x25 mm (incl. protective cap)

Item-no.	
40610	Material moisture meter
40611	Replacement rods (1 pair)

Grain moisture

Hay moisture

Grain Moisture Meter

The grain moisture meter is a powerful and handy humidity measuring instrument for grain, for determining the water content of many grain types.

Thanks to the Hold function the measuring value can be frozen on the display of the grain moisture tester until another button is pressed.

To increase the measuring accuracy and reproducibility, different hectolitre weight classes are stored in the device. This ensures that the bulk density does not affect the measuring result. The whole grain moisture tester series is calibrated and checked according to the calibratable kiln-drying method EN-ISO 712. Simultaneously, the moisture meter for grain also measures the sample temperature and includes it in the calculation of the measuring result.

To guarantee precise measuring values in the long run, after switching on the grain moisture meter automatically effects a self-calibration. After that, the corresponding calibration curve for the sample to measure can be selected at the moisture meter for grain.

- Without preparation of samples
- Measurement within seconds
- For all grain types
- Very fast to whole grain measurement
- HOLD-function
- Large, well-lit LC display
- Automatic temperature compensation
- Menu languages: English, German, Italian, French, Spanish, Russian and many others on request

Delivery contents: grain moisture meter, batteries, digital scale, measuring cup, manual, plastic case (only version FS1).

Technical data		
	FS1	**FS1.1**
Range depending on crop	5 - 30 % water	5 - 25 % water
Accuracy	± 0.7%	± 0.9%
Resolution	0.1 %	0.1 %
Sample volume	60 g	60 g

Item-no.	
49170	Grain Moisture Meter FS1
49180	Grain Moisture Meter FS1.1 (without case)

Hay Moisture Meter

Professional moisture meter to determine moisture and temperature of pressed hay or straw by inserting a measuring probe.

- Stable, fix mounted insertion stainless steel probe
- Large, well-lit LC display
- Automatic temperature compensation
- Measurement within seconds
- HOLD-function

Delivery contents: hay moisture meter with rubber protection cover and batteries. Optional: wooden case and test block.

Technical data	
Measuring range	8 - 40% / -20°... +120°C
Accuracy	1.0%
Resolution	0.5%
Sensor length	600 mm

Item-no.	
46040	Hay moisture meter, 60 cm

Further lenghts on request.

Hand auger equipment

Edelman Augers: find out more

Hand augers are extremely useful for soil science research and sampling for laboratory analyses. Each type of soil makes different demands to the different models of soil samplers. In the course of the years many models have been developed.

Years of experience and many contacts with soil researchers at home and abroad made it possible to achieve the optimum design for the four most popular types of hand augers: Edelman augers, Riverside augers, Stony soil augers and Spiral augers.

The augers have been made of a high grade non-toxic steel and a carefully selected hardening treatment contributes to achieve a wear resistant and solid design.

Single-part Augers

Combination   Coarse sand   Sand   Clay

This type of soil auger is by far the most used auger. The typical geodynamical design allows for a minimum of friction during penetration into and the extraction from the soil, which means less physical effort. There are 4 types: the clay-, sand-, coarse sand- as well as a combination type.

Technical data		
Augers	Weight	Dimensions
Edelman auger, clay type, Ø 7 cm	1.50 kg	123 x 39 x 6 cm
Edelman auger, sand type, Ø 7 cm	1.60 kg	124 x 39 x 7 cm
Edelman auger, coarse sand type, Ø 7 cm	1.70 kg	123 x 39 x 7 cm
Edelman auger, combinations type, Ø 7 cm	1.50 kg	124 x 39 x 7 cm

Item-no.	
42101	Edelman auger, clay type
42102	Edelman auger, sand type
42103	Edelman auger, coarse sand type
42104	Edelman auger, combination type

Bi-partite Augers

All mentioned augers are also available as bi-partite augers. Extension rods with bayonet connection can be applied when the sampling depth can not be reached with a single or standard bi-partite auger. With hand auger equipment a depth of 8-10 meter can realistically be achieved.

Technical data		
Augers	Weight	Dimensions
Handle standard version, 60 cm, bayonett	1.20 kg	68 x 38 x 2 cm
Bottom part clay type, Ø 7 cm	0.90 kg	96 x 6 x 6 cm
Bottom part sand type, Ø 7cm	0.85 kg	70 x 7 x 5 cm
Bottom part: coarse sand type, Ø 7 cm	1.10 kg	70 x 5 x 7 cm
Bottom part: combination type, Ø 7 cm	0.90 kg	69 x 6 x 6 cm

Item-no.	
42110	Handle standard, 60 cm
42115	Extension 100 cm, incl. bush
42111	Bottom part clay type
42112	Bottom part sand type
42113	Bottom part: coarse sand type
42114	Bottom part: combination type

## Hand auger

Riverside Auger

This design is very suitable for sampling in hard, stiff soils, mixed with fine gravel both above and below the ground water level. The very sharp extremities of the auger bits point at an angle downwards which makes the auger go through the soil easily.

Technical data		
Augers	Weight	Dimensions
Riverside auger, Ø 7 cm	2.20 kg	123 x 39 x 7 cm

Item-no.	
42105	Riverside auger

Stony Soil Auger
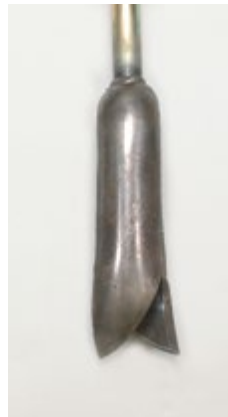
For soils with a large gravel content. The auger body for stony soils consists of a heavy steel strip, vaulted all along, which is bent double by forging. The pointed cutting bits of the strip are bent outward, thus creating a hole somewhat wider than the average body diameter.

Technical data		
Augers	Weight	Dimensions
Stony soil auger, Ø 7 cm	1.90 kg	122 x 7 x 7 cm

Item-no.	
42106	Stony soil auger

Spiral Auger

The spiral auger operates similar to a corkscrew and does not cut off the soil. The auger is usually applied when hard layers need to be penetrated, e.g. brick layers, chalk and lime profiles. The narrow twist drill pushes the stones aside while drilling and digs with specially shaped ends of a hole. The straight shape is created when pulling the drill much frictional resistance.

Technical data		
Augers	Weight	Dimensions
Spiral auger, Ø 4 cm	1.50 kg	126 x 39 x 4 cm

Item-no.	
42107	Spiral auger

Pot Sampling Auger

For pot and container plants – also suitable for lawn base layers.

Technical data	
Total length	410 mm
Sampling depth	300 mm
Outer Ø	16 mm
Inner Ø	13 mm
Weight	0.22 kg
Material	stainless steel

Item-no.	
42020	Pot sampling auger

Hand Sampling Auger

For flower and vegetable beds, as well as outdoor areas with natural soil.

Technical data	
Total length	600 mm
Sampling depth	300 mm
Outer Ø	17 mm
Inner Ø	12 mm
Weight	0.55 kg
Material	stainless steel

Item-no.	
42030	Hand sampling auger

Sampling Auger with foot rest

For grassland, lawns and open spaces. The footrest makes work easier.

Technical data	
Total length	810 mm
Sampling depth	300 mm
Outer Ø	20 mm
Inner Ø	14 mm
Weight	1.5 kg
Material	stainless steel

Item-no.	
42040	Sampling auger with foot rest

Soil samplers and equipment

Pürckhauer

The groove of the Pürckhauer 100 is end-tapered in the bottom part, thereby enabling an easier removal. Particularly suitable for medium and heavy soils.

We recommend urgently using the Simplex sledgehammer and not an iron hammer!

Technical data		
	Pürckhauer 60	Pürckhauer 100
Total length	810 mm	1175 mm
Graduation	every 100 mm	
Sampling depth	600 mm	1000 mm
Outer Ø	20 mm	top 28 mm, bottom 25 mm
Inner Ø	13 mm	18 mm
Weight	2.4 kg	3.8 kg
Hammering head Ø	34 mm	
Material	stainless steel, specially tempered	
Handle	with rubber shell sharpened for easy removal of soil sample	

Item-no.	
42070	Pürckhauer 60
42090	Pürckhauer 100

Simplex Sledge Hammer

Soil samplers with iron driving head should only be driven in the soil with plastic sledge hammers.

Further applications: Landscape gardening, fence constructions, etc.

Simplex sledge hammer, with cast iron housing, inserts: white "super-plastic" (2 parts).

Hickory handle.

All parts can easily be changed.

Supplied complete with 2 super-plastic inserts and handle.

Technical data	
Face diameter, Ø	100 mm
Handle length	1000 mm
Weight	5.3 kg

Item-no.	
42500	Simplex sledge hammer

Profile Spade Sampler
with reinforced sides

Fotoquelle: COMPO EXPERT GmbH

The Profile piercing spade is the ideal tool for assessment of turf-bearing layers. The sample is extracted with a special metal two-part extractor. After removal, the parts are unscrewed. The sample remains in one half of the spade and can very well visually be checked on soil and plant properties such as profile, composition, density, rooting quality and depth, etc.

After the examination, the sample can accurately be re-inserted into the lawn.

Technical data	
Material	stainless steel
Insertion depth	200 mm
Total length	650 mm
Weight	2.6 kg

Item-no.	
42060	Profile spade sampler

Soil Properties

Penetrometer

Penetrologger

The penetration resistance reflects the capacity of the soil and is a measure of how easily roots can penetrate it. This is particularly important in agriculture and in rural and urban civil engineering techniques. The penetration resistance is a mechanical variable, which depends between mineral particles in a particular soil on variable parameters, such as degree of humidity, density and strength of the compound. The penetration resistance is measured in many measurements with an electronic penetrometer with a data logger, the data is stored and analyzed in the data logger.

Benefits:
• Strong and reliable
• Built-in GPS, automatic data storage
• Soil moisture sensor optional
• Comparison modus for moisture recordings
• 500 fully digital depth / force recordings
• Numerous different projects can be established
• Velocity indicator supports correct insertion
• Averages and spreading indication

Application:
• Soil science and research
• Foundation engineering
• Verification of the agronomical usability of the soil
• Investigation of the anticipated growth conditions
• Research in case of poor growth conditions, e.g. for trees in municipal parks, streets, etc.
• Verification of artificial compaction for expertises
• Special research for golf course expert

Item-no.	
41015	Penetrologger
41016	Soil moisture sensor

Penetrometer
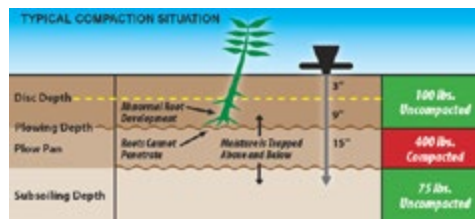
This penetrometer is designed for an exact determination of soil density. In compressed soil, the absorption of water and nutrients by the plant is only possible to a limited extent. A further consequence is the reduced air exchange in the soil and a reduction of N-mineralisation. Compacted soil also results in poor root and plant development. Because of the density, the roots cannot grow and loose their ability of transporting water and nutrients. That can reduce yields by up to 50%. This simple, robust penetrometer measures the penetration resistance of soils. It is pressed vertically into the ground by using both handles. The penetration resistance appears on an analogue display in psi on an easy-to-read colour display.

Application:
• Agriculture, e.g. determination of ploughing depth, and horticulture, e.g. care of sport grounds and golf courses
• Soil science researches; advisers and consultants expertises
• Foundation expertises (determining load-bearing capacity)

Delivery contents: penetrometer, small and large tips for heavy and light ground.

Technical data	
Probe	stainless steel probe with markings for soil depth
Measuring range	0 – 500 PSI (0 – 3500 kPa or kN/m²)
Probe length	700 mm
Dimensions	900 x 310 x 60 mm
Weight	2.2 kg

Item-no.	
41010	Penetrometer
41011	Tip, small 1/2"
41012	Tip, large 3/4"

Soil Compaction Probe

The soil probe is a technical aid for sensing soil layers of various densities, easy-to-use accessoire for consultants and soil experts.

Stainless steel with:

• Total length: 1100 mm
• Graduation: 100 mm
• Probe length: 900 mm
• Outer ø: 8 mm

Item-no.	
41020	Soil compaction probe

Soil Properties

ORDER

| **Mail** | **Phone** +49-(0)911-962605-0 | **Fax** +49-(0)911-962605-9 | **E-mail** info@ stepsystems.de |

STEP Systems GmbH

Duisburger Str. 44

90451 **Nuremberg**

Germany

Your customer number:

_____ _____
date   signature

Invoice address:	Delivery address (if different):
Company	Company
Name	Name
Street /number	Street /number
Postal code / city / country	Postal code / city / country
Phone	Phone
Fax	Fax

Please send us the following articles:

Quantity	Item-no.	Article	Price €

Your company: always in the focus

Useful promotional gifts draw attention on the name of your company

We also offer printings on all other items from our sales program.
Single or multi-coloured printings, small or big quantities - we print everything according to your demands.
Please contact us and we will be pleased to make you a non-binding offer.

Find more about our products on the Internet:

Web: www.stepsystems.de   Facebook: STEPsystems   YouTube: STEP Systems

STEP Systems GmbH

Soil - Water - Climate Testing Equipment

Duisburger Str. 44
90451 Nuremberg, Germany
Phone: +49 911 96 26 050
Fax: +49 911 96 26 059
e-mail: info@stepsystems.de
www.stepsystems.de