

AGRAR MEASURING EQUIPMENT

STELZNER®
Soil testing equipment



Development
Production
Consulting
Service

Soil meters
Gas and liquids analysis
Nutrient analysis
Climatic measuring systems
Accessories



PRODUCT CATALOGUE 2024



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On Jan. 1, 2022, PRONOVA Analysentechnik GmbH&Co.KG, the STELZNER® product range, acquired the exclusive products and brand name of the „Tensiometer“ products from Bambach Tensio-Technik GbR.

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You can order all products online from our website. That's where you'll also find further products and information from our sectors: gas analysis technology, biogas analysis technology and water analysis technology. You can also find out about our upcoming trade fair schedule here. We'd be happy to consult with you while you're at the trade fair.

pH MEASURING EQUIPMENT

Measurements in soil and liquids

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SOIL MEASUREMENTS

pH AGRAR 2000

30003002

30003010
for water

30003011, for soil and water

For measuring pH either directly on-site in the soil or in the lab

The pH AGRAR 2000 is an important tool for monitoring crop nourishment. Plants grow optimally when a pH range is maintained specifically for that specific plant.

The absorption of certain key nutrients can be hindered if the pH value is either too high or too low. The Technical manual delivered with your Stelzner product contains a detailed list of optimal plant-specific pH values.

The microprocessor-controlled pH AGRAR 2000 is easy to handle and very precise. It also features a piercing electrode made from glass that is custom designed for agriculture. This makes it the perfect device for agricultural measurements. It features straight-forward pH 4 and pH 7 automatic calibration. The electrode conductivity slope is displayed (in mV/pH) on the device so that you can check the sensitivity of the pH electrode. An alert is displayed if the pH electrode sensitivity is too low. You can still take measurements when the sensitivity is reduced but you should replace the pH electrode with a new one as soon as possible. Our special pH piercing electrode made from glass features three ceramic diaphragms and a liquid electrolyte. The electrolyte prevents the diaphragms from becoming clogged up with soil. This increases the durability and lifespan of the entire unit. The base unit is enclosed in a sturdy housing that is built to withstand the most demanding requirements of field and lab use.

The pH AGRAR 2000 can be used for direct crop measurements or also for checking substrates, fertilizer solutions and even water quality.

**TECHNICAL SPECIFICATIONS:**

Measurement range:	0 to 14
Resolution:	0.01
Accuracy:	± 0.02
Display:	Liquid crystal display
Operating temperature:	+5 to +45 °C
Power supply:	One 9-volt battery, size 6LR61
Run time:	approx. 100 hours
Degree of protection:	IP 40
Dimensions and weight:	125 x 75 x 45 mm, 190 g
Dimensions and weight with case:	370 x 290 x 90 mm, approx. 3.0 kg

ARTICLE NO.

30003003 pH AGRAR 2000
Base unit without electrode

30003002 pH AGRAR 2000 Set
complete with case

pH AGRAR 2000 with pH piercing electrode made from glass pH 4 and pH 7 buffer solutions, KCl refill solution with filler syringe, CaCl₂ powder for analysing soil solutions, dibble rod, spray bottle with deionized water, Technical manual

ACCESSORIES

30003011 pH piercing electrode made of glass, with three diaphragms, 3 mole/l KCl, 1 metre attached cable with BNC plug

30003033 pH piercing electrode made from glass, with three diaphragms, 3 mole/l KCl, without cable

30003004 1 metre attached cable with BNC plug for pH piercing electrode made of glass Article No. 30003033

30003010 pH plastic electrode for liquids only, with liquid electrolyte, 1 metre attached cable with BNC plug

30003028 Cap for pH electrodes

30003012 pH 4.0 buffer solution 100 ml bottle

30003013 pH 7.0 buffer solution 100 ml bottle

30003014 pH 4.0 buffer solution 1000 ml bottle

30003015 pH 7.0 buffer solution 1000 ml bottle

30003026 Buffering tablets* for calibration solutions 5 tablets for pH 4

30003027 Buffering tablets* for calibration solutions 5 tablets for pH 7

30003016 Buffering tablets* for calibration solutions 2 x 5 tablets for pH 4 and pH 7

* Dissolve 1 tablet in 100 ml distilled water.

30000504 Calcium chloride [CaCl₂] for soil analysis (approx. 11.1 g for 10 l solution of 0.01 mole/l)

30000505 Calcium chloride [CaCl₂] for soil analysis (approx. 100 g)

30001004 Spray bottle with deionized water

30003022 Refill solution with filler syringe for pH electrodes 3 mole/l KCl, 100 ml bottle

30003017 Dibble rod

30002014 Beaker for measuring volume, 100 ml with lid

30003019 One 9-volt battery, size 6LR61



SOIL MEASUREMENTS

pH Soiltester



Sturdy tester for direct measurements in the field

The pH Soiltester is the classic solution for taking simple pH measurements in natural soil. It comes with an integrated moisture control mechanism. The tester does not need a power supply. It is not suitable for taking measurements in liquids or peat substrata.

TECHNICAL SPECIFICATIONS:

Measurement range:	3 to 8
Accuracy:	± 10%
Display:	multi-colour scale
Dimensions and weight:	160 x 50 mm, 170 g

ARTICLE NO.	
30003000	Soiltester pH Meter Soiltester, measuring sleeve, sand paper, manual with pH guideline values
ACCESSORIES	
30003020	Soil-sample measuring sleeve for the Soiltester pH meter
30003023	Sand paper

Hellige pH meter

Manufactured in-house

**Simple pH soil testing**

The Hellige pH meter is a simple indicator test. This complete kit with instructions includes:

- pH measuring plate with colour scale,
- Small spoon for soil samples and dropper bottle for taking 30 to 40 tests
- with the soil indicator.

It is manufactured in accordance with the original design after the product rights were acquired.

ARTICLE NO.	
30002999	Hellige pH meter
ACCESSORIES	
30002998	Indicator solution Refill solution, 100 ml bottle Sufficient for 60 to 80 tests
Other bundles are available on request.	

Indicators



Our non-bleeding pH indicator sticks are used for taking quick and easy pH measurements in soil solutions and water.

TECHNICAL SPECIFICATIONS:

Measurement range:	pH: 0 to 14
Divisions:	0-1-2-3-4-5-6-7-8-9-10-11-12-13-14
Measurement range:	pH: 2 to 9
Divisions:	2,0-2,5-3,0-3,5-4,0-4,5-5,0-5,5-6,0-6,5-7,0-7,5-8,0-8,5-9,0
Multi-sticks for aquarium use:	Total hardness: 5° to 25° d Carbonate hardness: 3° to 20° d pH: 6.4 to 8.4

ARTICLE NO.	
30002083	Measurement range: 0 to 14 pH 100 pieces
30002084	Measurement range: 2 to 9 pH 100 pieces
30002085	Multi-sticks 100 pieces

PH MEASUREMENT TECHNOLOGY

CHAPTER 1

SOIL MEASUREMENTS

pH 205

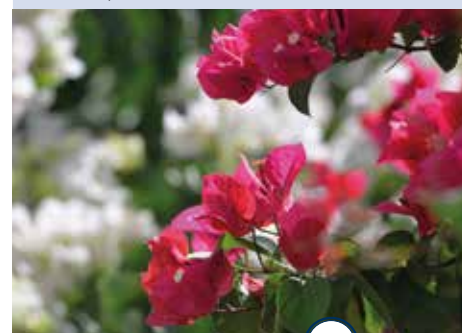
**Precise measurements of pH and temperature for small sample volumes**

The pH 205 is a handy insertable meter for measuring pH and temperature. It features automatic temperature compensation. This device is well suited when only small samples are available for measuring, such as for a small partition in a cultivation system. It can also be used to measure in solutions. The insertable probe tip is embedded in impact-resistant plastic. The tip is not sensitive to contamination (thanks to the hole diaphragm) and can be easily replaced. The device also features an illuminated display and buttons with acoustic feedback. Single, double or triple point calibration is possible. The calibration process automatically detects the end value.

TECHNICAL SPECIFICATIONS:

Measuring range:	pH: 0 to 14 Temperature: 0 to + 60 °C
Resolution:	pH: 0.01 Temperature: 0.1 °C
Precision:	pH: ± 0.02 Temperature: ± 0.4 °C
Display:	two-character illuminated LCD display
Operating temperature:	During operations: 0 to +50 °C Storage: -20 to +70 °C
Power supply:	4 LR44 button-cell batteries
Run time:	approx. 80 hours
Degree of protection:	IP 65
Dimensions and weight:	145 x 38 x 167 mm, 215 g
Dimensions and weight with case:	400 x 320 x 90 mm, 2.7 kg

ARTICLE NO.	
30003100	pH 205 Base unit with insertion probe, retention cap, belt/wall holder
30003102	pH 205 starter set One-hand pH/°C meter with insertion probe, storage cap, gel and calibration bottles, 250 ml pH 4 and pH 7 Belt/wall holder and aluminium case
ACCESSORIES	
30003101	Retention cap for pH 205 with KCl gel filling
30003103	Spare probe for pH 205
30003030	pH 4.0 buffer solution, 250 ml bottle
30003031	pH 7.0 buffer solution, 250 ml bottle
30003032	pH 10.0 buffer solution, 250 ml bottle



LIQUID MEASUREMENTS

pHep4



pH/T Pocket Tester

The pH/T pocket tester pHep4 is designed for taking simple and speedy pH measurements in liquids. It features automatic temperature compensation. In addition to the dual display, the device features a waterproof housing and other attractive features: such as battery charge indicator (no more incorrect measurements due to weak batteries), and electrode that can be replaced in seconds, a stability indicator for reading the measured value, automatic switch-off, automatic calibration (1- or 2-point) and a HOLD function to freeze the measured value.

TECHNICAL SPECIFICATIONS:

Measurement range:	pH: 0 to 14 Temperature: 0 to +60 °C
Resolution:	pH: 0.1 Temperature: 0.1 °C
Precision:	pH: ± 0.1 Temperature: ± 0.5 °C
Display:	two-character LCD display
Operating temperature:	0 to +50 °C
Power supply:	Four 1.5 volt batteries
Run time:	approx. 350 hours
Dimensions and weight:	163 x 40 x 26 mm, 85 g
Special features:	water-proof

ARTICLE NO.	
30003008 pHep4	pH/T pocket tester with buffer solution pH 4 and 7, wrench
ACCESSORIES	
30003009	Spare pH electrode for the pHep4/Combo
30003005	pH 4.0 buffer solution, 20 ml bag
30003006	pH 7.0 buffer solution, 20 ml bag

pH 55



pH/T pocket tester

The pH 55 is a small, pocket-sized water-proof pH tester. It takes quick and easy measurements in liquids and filtered soil solutions. It is suitable for use in horticulture, landscaping, aquariums, hydroponics, swimming pools, ponds and in the laboratory. It has an automatic calibration function (1-point or 2-point) and a replaceable electrode.

TECHNICAL SPECIFICATIONS:

Measurement range:	pH: -2.0 to 16.0 Temperature: -5.0 to +60 °C
Resolution:	pH: 0.1 Temperature: 1 °C
Precision:	pH: ± 0.1 Temperature: ± 0.5 °C
Display:	two-character LCD display
Operating temperature:	-5.0 to +50 °C
Power supply:	Four 1.5 volt batteries (LR44)
Run time:	approx. 300 hours
Dimensions and weight:	200 x ø 38 mm, 100 g
Special features:	water-proof

ARTICLE NO.	
30003007 pH 55	pH/T pocket tester with buffer solution
ACCESSORIES	
30003034	Replacement pH electrode for the pH 55
30003005	pH 4.0 buffer solution, 20 ml bag
30003006	pH 7.0 buffer solution, 20 ml bag

pH flow meter



pH measuring transducer

with display and analogue output. Suitable for stationary measurements of the pH value within pipes or open ponds. Automatic or manual temperature compensation.

TECHNICAL SPECIFICATIONS:

Measurement range:	0.00 to 14.00
Resolution:	0.01
Accuracy:	± 0.02
Display:	Liquid crystal display
Analogue output:	4 – 20 mA
Power supply:	24 VDC
Degree of protection:	IP 65, except for the connections for the electrodes and temperature
Mounting:	Wall mount
Dimensions:	82 x 80 x 55 mm

ARTICLE NO.	
30003201 pH flow meter	Base unit without pH electrode
30003010-A	pH plastic electrode for liquids only, with gel electrolyte, 1 metre attached cable with BNC plug
30003210 One-inch T-flow fitting	Tee piece with fitting aid, screw or adhesive connection, PVC material
30003211 One-inch angled seat fitting	with fitting aid, screw or adhesive connection, PVC material
30003212 One-inch double-L fitting	with fitting aid, screw or adhesive connection, PVC material
Other flow fittings are available on request.	

MEASURING ACTIVITY DIRECTLY IN SOIL

PET 2000



30001100



Activity measurements and monitoring of crop nourishment

The PET 2000 activity meter can measure the potential absorption of nutrient salts under the same conditions as the actual nutrient salt absorption through the roots. This means that the dissolved salt content is measured in the soil and substrata and thus corresponds to the direct "activity" within the plant canopy. The displayed units are g/l (e.g., grams of salt per litre of substratum). All related soil properties (such as fertilizer concentration, soil humidity, volume density and temperature) and taken into account for the measurement.

The accompanying Technical manual can then be used to properly evaluate the measured salt content. In landscape architecture, tree schools, nursery gardens, public parks, forests and all other areas where plants are cultivated, this meter helps to verify and monitor your plan of action. You can optimize your cultivation results with the PET 2000.

When high salt content is being measured, the nitrate test strips (art. no 1100) can be used to differentiate between nitrogen and accompanying salts. The AM probe is available in a variety of lengths (25, 50 or 75 cm with 10-mm diameter) to fit the application.

Longer probes are available on request. The AM probe is made from stainless steel and has a 3-cm measuring tip. The probe is maintenance-free. It come with a 9-Volt battery and a splash-water resistant enclosure.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 2 g/l
Resolution:	0.01 g/l
Accuracy:	± 0.02 g/l
Display:	Liquid crystal display
Operating temperature:	+ 5 to + 45 °C
Power supply:	One nine-volt battery, size 6LR61
Run time:	25 hour
Degree of protection:	IP 40
Dimensions and weight:	125 x 75 x 45 mm, 190 g
Dimensions and weight with case:	370 x 290 x 90 mm approx. 2.7 kg

ARTICLE NO.	
30001000	PET 2000 activity meter
	Base unit without AM probe, Connection: mini-DIN plug (8-pin)
30001100	Soil advisory kit, type X
	PET 2000 with AM probe (25 cm) and mini-DIN 8-pin plug, 6 nitrate test strips, 100 ml beaker, spray bottle with deionized water, Technical manual
ACCESSORIES	
30001001	AM probe (75 cm) with mini-DIN 8-pin plug
30001002	AM probe (50 cm), 1 m cable, with mini-DIN 8-pin plug
30001003	AM probe (25 cm), 1 m cable, with mini-DIN 8-pin plug
30002005	Nitrate test strips Box with 100 strips
30008102	Nitrate (each bag with 6 test strips)
30001004	Spray bottle with deionized water
30002014	Beaker for measuring volume, 100 ml with lid
30003019	One 9-volt battery, size 6LR61



MEASURING ACTIVITY DIRECTLY IN SOIL

PE controller



Straightforward monitoring of plant nourishment

The PE controller is designed for simple on-site monitoring of plant nourishment. It can measure the potential absorption of nutrient salts under the same conditions as the nutrient salt absorption through the roots as the time of the measurement. This easy-to-use instrument can display on-site whether there is too little, too much, or the right amount of available fertilizer present.

The measurement is taken directly in the substratum, compost, garden soil, or greenhouse.

This allows you to monitor the nutrient status potted plants, balcony boxes, container plants and vegetable beds. You can be sure that you're not using too much or too little nutrients with the PE controller. This handy tool is a must for every hobby gardener.

The probe is 25 cm long and has a diameter of 10 mm.

ARTICLE NO.	
30001011	PE controller with AM probe
30001012	PE controller with case
	PE controller with AM probe (25 cm), nitrate test strips, 100 ml beaker, spray bottle with deionized water
ACCESSORIES	
30002005	Nitrate test strips, Box with 100 strips
30008102	Nitrate (each bag with 6 test strips)
30001004	Spray bottle with deionized water
30003019	One 9-volt battery, size 6LR61

LIQUID MEASUREMENTS

EC 2000



Measuring conductivity in solutions

Electrical conductivity determines the electrical current between two points (electrodes) of different voltage potentials in a liquid. The conductivity increases as the amount of salt, acid or base contained in a solution increases. Conductivity is measured in units of mS/cm. The scale for water-based solutions starts with pure water (conductivity equals 0.05 $\mu\text{S}/\text{cm}$ at 25 °C) and ends with a basic solution of 1.0 S/cm (e.g. potassium solutions). Potable or surface water has a conductivity value in a range from 0.1 to 1.0 mS/cm.

Conductivity is measured using a measuring cell which consists (in the simplest case) of two similar electrodes. An AC voltage is applied to an electrode and this causes the ions in the solution to move in relation to the electrode. More current flows between the electrodes when more ions are contained in the solution. Using this measured current, the meter calculates the conductance of the solution and then, based on the cell specification, the actual conductivity value.

Areas of applications:

For horticulture, the conductivity value is also referred to as the EC value. The EC value is an indicator for the quantity of dissolved salts. It is specified in mS/cm.

The EC 2000 is used in all areas of cultivation and irrigation systems, including classic floriculture, substrata production and soil-free cultivation. It enables you to monitor basis solutions and nutrient solutions during fertilization. You can also check the salt content in substrata mixtures. Please note: For the basis and nutrient salt solutions with high salt content, we recommend using the glass-platinum conductivity electrode instead of the carbon conductivity electrode.

In solutions with high salt concentrations, the glass-platinum conductivity electrode has less polarization and thus provides improved linearity and more accurate readings.

The EC 2000 is a precise measuring instrument with temperature compensation that can be calibrated.

It is used for quickly determining the mS/EC values in solutions from 0 – 20 mS/cm (with a carbon conductivity electrode) or 0 – 200 mS/cm (using a glass-platinum conductivity electrode).

TECHNICAL SPECIFICATIONS:

Measurement range:	Conductivity: 0 to 20 mS/cm with carbon conductivity electrode and 0 to 200 mS/cm with glass-platinum conductivity electrode Temperature: +5 to +45 °C
Resolution:	Conductivity: 0.1 mS/cm Temperature: 0.1 °C
Accuracy:	Conductivity: 0 to 20 mS/cm $\pm 2\%$ 20 to 200 mS/cm $\pm 5\%$ Temperature: ± 0.2 °C
Display:	Liquid crystal display
Operating temperature:	+ 5 to + 45 °C
Power supply:	One 9-volt battery, size 6LR61
Degree of protection:	IP 40
Dimensions and weight:	125 x 75 x 45 mm, 190 g
Dimensions and weight with case:	370 x 290 x 90 mm, approx. 2.9 kg

ARTICLE NO.	
EC 2000	
30004094	conductivity meter, for conductivity electrode with miniature plug (5-pin)
	Base unit without electrode
EC 2000 Set	
30004095	conductivity meter, complete with case
	EC 2000 with carbon conductivity electrode, with miniature plug (5-pin), calibration solutions (1.4 mS/cm and 12.88 mS/cm), spray bottle with deionized water, beaker, Technical manual
3000 4095-P	EC 2000 Set Conductivity meter, complete with case
	EC 2000 with glass-platinum conductivity electrode, with miniature plug (5-pin), calibration solutions (1.4 mS/cm, 12.88 mS/cm and 111.8 mS/cm), spray bottle with deionized water, beaker, Technical manual
ACCESSORIES	
30004093	Carbon conductivity electrode, 1 metre cable, temperature sensor NTC 10 K with miniature plug (5-pin), for EC 2000
30004195	Glass-platinum conductivity electrode, 1 metre cable, temperature sensor NTC 10 K with miniature plug (5-pin), for EC 2000
30002014	Beaker for measuring volume, 100 ml with lid
30001303	Calibration solution, 1.4 mS/cm, 100 ml bottle
30001308	Calibration solution, 12.88 mS/cm, 100 ml bottle
30001004	Spray bottle with deionized water
30001304	Calibration solution, 111.8 mS/cm 100 ml bottle
30003019	One 9-volt battery, size 6LR61



LIQUID MEASUREMENTS

DiST 6



EC/TDS pocket tester

The EC/TDS DiST6 pocket tester enables you to monitor the conductivity (EC), TDS and temperature simultaneously. The EC, TDS and temperatures values can all be displayed at the same time.

TDS stands for total dissolved solids (i.e., the total amount of dissolved salts in a solution). The total amount of nutrient salts present in the irrigation water influences the capability of the roots to absorb nutrients. It also has an enduring effect on plant growth. For these reasons, it is important to check the TDS content regularly.

The TDS value is closely related to the conductivity value and is also an indication of water hardness. The EC/TDS pocket tester features a swappable probe, adjustable TDS factor, selectable temperature coefficient (β), a battery-change display, a stability indicator, automatic shut-off, automatic temperature compensation, a water-proof housing and a HOLD function for freezing measured values.

TECHNICAL SPECIFICATIONS:

Measurement range:	Conductivity: 0 to 20 mS/cm
	TDS: 0 to 10 g/l
	Temperature: 0 to 60 °C
Resolution:	Conductivity: 0.01 mS/cm
	TDS: 0.01 g/l
	Temperature: 0.1 °C
Accuracy:	Conductivity: $\pm 2\%$ of the measuring range
	TDS: $\pm 2\%$ of the measuring range
	Temperature: $\pm 0.5\%$ °C
Display:	two-character LCD display
Operating temperature:	0 to 50 °C
Power supply:	Four 1.5 volt batteries
Run time:	100 hour
Dimensions and weight:	163 x 40 x 26 mm, 85 g
Special features:	EC/TDS selectable 0.45 to 1.00
	Selectable temperature coefficient (β) 0.0 to 2.4 %/°C
	waterproof

ARTICLE NO.
30004105 Dist6
EC/TDS pocket tester with calibration solution
ACCESSORIES
30001305 Calibration solution of 12.88 mS/cm 20 ml bag

EC 59



EC/TDS pocket tester

The EC 59 is a small, pocket-sized water-proof EC tester. It takes quick and easy measurements in liquids and filtered soil solutions. It is suitable for use in horticulture, landscaping, aquariums, hydroponics, swimming pools, ponds and in the laboratory.

It features an automatic calibration function (1,413 μ S/cm) and a replaceable electrode.

TECHNICAL SPECIFICATIONS:

Measurement range:	Conductivity: 0 to 3,999 μ S/cm
	TDS: 0 to 2,000 ppm
	Temperature: 0.0 to +60 °C
Resolution:	Conductivity: 1 μ S/cm
	TDS: 1 ppm
	Temperature: ± 0.1 °C
Accuracy:	Conductivity: $\pm 2\%$ of the measuring range
	TDS: $\pm 2\%$ of the measuring range
	Temperature: ± 0.5 °C
Display:	two-character LCD display
Operating temperature:	-5.0 to +50 °C
Power supply:	Four 1.5 volt batteries (LR44)
Run time:	approx. 100 hours
Dimensions and weight:	200 x \varnothing 38 mm, 100 g
Special features:	water-proof

ARTICLE NO.
30004092 EC 59
EC/TDS pocket tester with calibration solution
ACCESSORIES
30004109 Replacement EC electrode for EC 59
30001306 Calibration solution, 1.4 mS/cm, 20 ml bag

EC flow meter



Conductivity flow meter

Conductivity measuring transducer with display and analogue output. Suitable for stationary conductivity measurements within pipes or open ponds. Optionally displays the temperature. Fully scalable output signal.

TECHNICAL SPECIFICATIONS:

Measurement range:	0.0 to 200.0 μ S/cm
	0 to 2,000 mS/cm
	0.00 to 20.00 mS/cm
	0.0 to 200.0 mS/cm
Accuracy:	$\pm 0.5\%$ of measured value $\pm 0.3\%$ FS
Display:	Liquid crystal display
Analogue output:	4 – 20 mA
Power supply:	24 VDC
Degree of protection:	IP 65, except for the connections for the electrodes and temperature
Mounting:	Wall mount
Dimensions:	82 x 80 x 55 mm

ARTICLE NO.
30004200 EC flow meter
Base unit with conductivity electrode, 1m cable
30003210 One-inch T-flow fitting
Tee piece with fitting aid, screw or adhesive connection, PVC material
30003211 One-inch angled seat fitting
with fitting aid, screw or adhesive connection, PVC material
30003212 Double-L fitting 1"
with fitting aid, screw or adhesive connection, PVC material
Other flow fittings are available on request.



MEASURING IN SOIL AND LIQUIDS

MULTI 2000



The type-IX advisory kit for measuring pH, activity, conductivity and temperature

The new MULTI 2000 integrates all the measuring possibilities of several meters into one instrument: it can take direct measurements of salt content, conductivity, temperature and pH value.

The activity of soils and substrata can also be determined with the MULTI 2000 meter. This activity corresponds to the dissolved total salt content (in grams of salt per litre). The meter measures directly in the plant canopy, the soil, or substrata (e.g. directly at the roots). This gives insight into the potential absorption of nutrient salts by plants while taking all soil characteristics into consideration (such as temperature, moisture and density). The scheduling of fertilization is simplified when periodic activity measurements are carried out. During crop development, you can monitor different soil layers for nutrient availability, long-term fertilizer attributes and deployed fertilizer concentration.

The electrical conductivity in a solution can be measured by switching into EC mode and attaching the corresponding temperature-compensated conductivity electrode. You can make a targeted calculation of your fertilizer use by factoring in the EC value of the water you are using. This is the basis for all crop processes that use irrigation-based fertilization, including surface fertilization, dam irrigation, drip irrigation, and also particularly for soil-free crops.

The new microprocessor-controlled MULTI 2000 is also useful for providing a quick and reliable check of the pH value. You can use this meter to check the conductive slope (and functionality) of a pH electrode.

The pH glass piercing electrode comes with several diaphragms. Thus it is possible to measure in solutions, substrata, natural soils or mineral wool. This type of device is innovative because it allows you to measure temperatures in the field. A temperature probe is integrated in the conductivity electrode. So the temperature is measured in the same place that the pH, activity and conductivity are being monitored (e.g. in the fertilizer solution or in the different potting depths). The temperature probes can be used either in solutions or in substrata. The Technical manual includes instructions, guideline tables, usage tips, and the EC values of typical fertilizers.

TECHNICAL SPECIFICATIONS:

Measurement range:	pH: 0 to 14
	Activity: 0 to 2 g/l
	Conductivity: 0 to 200 mS/cm
Resolution:	pH: 0.01
	Activity: 0.1 g/l
	Conductivity: 0.01 mS/cm
Accuracy:	pH: ± 0.02
	Activity: ± 0.2 g/l
	Conductivity: $\pm 2\%$
	0 to 10 mS/cm
	$\pm 5\%$ 10 to 200 mS/cm
Display:	Liquid crystal display
Operating temperature:	+5 to +45 °C
Power supply:	One 9-volt battery, size 6LR61
Degree of protection:	IP 40
Dimensions and weight:	180 x 65 mm / 80 x 40/50 mm,
	280 g
Dimensions and weight with case:	460 x 350 x 135 mm;
	4.7 kg

ARTICLE NO.	
30001201	MULTI 2000 Base unit without electrode
30001200	Advisory kit, type IX pH, conductivity, activity MULTI 2000 with pH piercing electrode made of glass, AM probe (25 cm) with mini-DIN 8-pin connector, four-wire carbon conductivity electrode, pH 4 and pH 7 buffer solutions, calibration solutions (1.4 mS/cm, 12.88 mS/cm and 111.8 mS/cm), KCl filling solution, CaCl ₂ powder for analysis in soil solutions, dibble rod, six nitrate test strips, beaker, spray bottle with deionized water, Technical manual
3000 1300-M	Advisory kit, type III Conductivity, activity (functionality similar to the PET 2000 KOMBI) Multi 2000 with four-wire carbon conductivity electrode and AM probe (25 cm) with mini-DIN 8-pin plug, six nitrate test strips, calibration solutions (1.4 mS/cm, 12.88 mS/cm and 111.8 mS/cm), beaker and spray bottle with deionized water, Technical manual
ACCESSORIES	
30004097	Four-wire carbon conductivity electrode, 1 metre cable, temperature sensor NTC 30 K, Mini-DIN 8-pin plug
30003011	pH piercing electrode made of glass, with three diaphragms, 3 mole/l KCl, 1 metre attached cable with BNC plug
30003033	pH piercing electrode made from glass, with three diaphragms, 3 mole/l KCl, without cable
30003004	1 metre attached cable with BNC plug for pH piercing electrode made of glass Article No. 30003033
30003012	pH 4.0 buffer solution, 100 ml bottle
30003013	pH 7.0 buffer solution, 100 ml bottle
30000504	Calcium chloride [CaCl ₂] for soil analysis (approx. 11.1 g for 10 litres of 0.01 mole/l solution)
30000505	Calcium chloride [CaCl ₂] for soil analysis (approx. 100 g)
30003022	Refill solution with filler syringe for pH electrodes, 3 mole/l KCl, 100 ml bottle
30003017	Dibble rod
30003028	Cap for pH electrodes
30001003	AM probe (25 cm), 1 metre cable with mini-DIN 8-pin plug
30002005	Nitrate test strips, Box with 100 strips
30008102	Nitrate (each bag with 6 test strips)
30001303	Calibration solution, 1.4 mS/cm, 100 ml bottle
30001308	Calibration solution, 12.88 mS/cm, 100 ml bottle
30001304	Calibration solution, 111.8 mS/cm, 100 ml bottle
30002014	Beaker for measuring volume, 100 ml with lid
30001004	Spray bottle with deionized water
30003019	One 9-volt battery, size 6LR61
30004444	Technical manual

Other calibration solutions are available on request.

LIQUID MEASUREMENTS

Combo



Pocket tester for pH, conductivity and Temperature

The Combo pocket tester can take simple and speedy measurements of all key parameters, including the pH, the conductivity (EC or TDS) and the temperature. Temperature compensation is carried out automatically for the pH and EC/TDS measurements. The user can specify the EC/TDS factor between 0.45 and 1.00. The temperature coefficient (β) can be set in a range from 0.0 to 2.4% per degree Celsius. The HOLD function can be used to keep a measured value on the display. The Combo is housed in a water-proof enclosure and features a large double display.

The pH electrode can be swapped out by the user. The EC/TDS probe is very resistant to salt and other aggressive sample mediums.

TDS stands for total dissolved solids (i.e., the total amount of dissolved salts in a solution). The TDS value is closely related to the conductivity value. The total amount of nutrient salts present in the irrigation water influences the capability of the roots to absorb nutrients. It also has an enduring effect on plant growth. For these reasons, it is important to check the TDS content regularly.

TECHNICAL SPECIFICATIONS:

Measurement range:	Conductivity: 0 to 20 mS/cm
	TDS: 0 to 10 ppt (g/L)
	pH: 0 to 14
	Temperature: 0 to 60 °C
Resolution:	Conductivity: 0.01 mS/cm
	TDS: 0.01 ppt
	pH: 0.01
	Temperature: 0.1 °C
Accuracy:	Conductivity,
	TDS: $\pm 2\%$ of the measuring range
	pH: ± 0.05
	Temperature: ± 0.5
Display:	two-character LCD display
Operating temperature:	0 to +50 °C
Power supply:	Four 1.5 volt batteries
Run time:	approx. 100 hours
Dimensions and weight: 163 x 40 x 26 mm, approx. 85 g	
Special features: EC/TDS selectable from 0.45 to 1.00	
Temperature coefficient β selectable 0.0 to 2.4 %/°C	
waterproof	

ARTICLE NO.

30003900 Combo

pH/EC/T pocket tester with pH 4, pH 7 and 12.88 mS/cm solutions

ACCESSORIES

30003009 Spare pH electrode for the pHep4/Combo

30003005 pH 4.0 buffer solution, 20 ml bag

30003006 pH 7.0 buffer solution, 20 ml bag

30001305 Calibration solution, 12.88 mS/cm 20 ml bag



MULTI-FUNCTIONAL METER

CHAPTER 4

LIQUID MEASUREMENTS

MW 804



Pocket tester for pH, conductivity and Temperature

The MW 804 is a small, waterproof pocket tester for taking quick and easy measurements of pH and conductivity (EC or TDS) in liquids and filtered soil solutions. The temperature is also measured and temperature compensation is carried out.

It is suitable for use in horticulture, landscaping, aquariums, hydroponics, swimming pools, ponds and in the laboratory. It has an automatic calibration function and a replaceable electrode. It is waterproof against brief immersions (but not suitable for continuous measurement or permanent usage in liquids or in a tank). The device switches off automatically after 8 minutes of non-use.

The conductivity/TDS factor can be selected between 0.45 and 1.00. The temperature coefficient β can be set between 0.0 to 2.4%/°C. The calibration of the pH electrode can be carried out with one or two points. The conductivity needs one calibration point.



ARTICLE NO.

30003910 MW 804

ACCESSORIES

30003911 Replacement electrode for MW 804

30003005 pH 4.0 buffer solution, 20 ml bag

30003006 pH 7.0 buffer solution, 20 ml bag

30001305 Calibration solution, 12.88 mS/cm 20 ml bag

TECHNICAL SPECIFICATIONS:

Measurement range:	pH: 0.0 to 14.0
	Conductivity: 0 to 20 mS/cm
	TDS: 0 to 10 ppt
	Temperature: 0 to +50 °C
Resolution:	pH: 0.1
	Conductivity: 0.01 mS/cm
	TDS: 0.01 ppt
	Temperature: 0.1 °C
Accuracy:	pH: ± 0.05
	Conductivity / TDS: 2% meas.value
	Temperature: ± 0.5
Display:	two-character LCD display
Operating temperature:	0 to +50 °C
Power supply:	Four 1.5 volt batteries (LR44)
Run time:	approx. 100 hours
Dimensions and weight:	200 x \varnothing 38 mm, 100 g
Special features:	waterproof

MEASURING IN SOIL AND LIQUIDS

Type-V advisory kit



Measuring activity and pH

The Type-V combination kit consists of two instruments: the PET 2000 for measuring soil activity (in g salt/l) and the pH AGRAR 2000 for measuring soil or liquid pH values.

The PET 2000 is used for the quick and reliable monitoring of plant nutrients in soils or substrata. It measures the plant's root zone for potential nutrient salt absorption. You can determine immediately whether the total salt content in the root zone is too high, too low or just right. The PET 2000 has a 25-cm AM probe. 50-cm or 75-cm probes are also available (refer to page 7). This device is maintenance-free.

The pH AGRAR 2000 allows you to reliably monitor the pH level. The glass pH piercing electrode allows you to determine the pH in substrata, soil (in the root zone), in fertilization solutions or in irrigation water.

The pH AGRAR 2000 features automatic pH calibration. It also displays the electrode conductivity slope so you can monitor the pH electrode. The Type-V combination kit is the perfect companion while working in production facilities, landscaping consulting, earthworks, garden centres, tree care or vegetable crops. All of the kit's instruments are microprocessor-controlled and highly accurate. They are easy to use and custom designed for agricultural applications.

TECHNICAL SPECIFICATIONS:

	pH AGRAR 2000
Measurement range:	0 to 14
Resolution:	0.01
Accuracy:	± 0.02
	PET 2000
Measurement range:	0 to 2 g/l
Resolution:	0.01 g/l
Accuracy:	± 0.02 g/l
	Type-V advisory kit
Dimensions and weight with case:	460 x 350 x 135 mm approx. 4.4 Kg

ARTICLE NO.	
30001500	Type-V advisory kit pH, activity pH 4 and pH 7 buffer solutions, KCl refill solution with filler syringe, CaCl ₂ powder for analysing soil solutions, dibble rod, spray bottle with deionized water, PET 2000 with AM probe (25 cm) and mini-DIN 8-pin plug, 6 nitrate test strips, Technical manual
ACCESSORIES	
30003011	pH piercing electrode made of glass, with three diaphragms, 3 mole/l KCl, 1 metre attached cable with BNC plug
30003033	pH piercing electrode made from glass, with three diaphragms, 3 mole/l KCl, without cable
30003004	1 metre attached cable with BNC plug for pH piercing electrode made of glass Article No. 30003033
30003012	ph 4.0 buffer solution, 100 ml bottle
30003013	ph 7.0 buffer solution, 100 ml bottle
30001004	Spray bottle with deionized water
30003022	Refill solution with filler syringe for pH electrodes 3 mole/l KCl, 100 ml bottle
30003017	Dibble rod
30001003	AM probe (25 cm), 1 metre cable with mini-DIN 8-pin plug
30002005	Nitrate test strips Box with 100 strips
30008102	Nitrate (each bag with 6 test strips)
30002014	Beaker for measuring volume, 100 ml with lid
30004444	Technical manual
30003019	Nine-volt battery, size 6LR61



MEASURING IN SOIL AND LIQUIDS

Type-VII advisory kit



For measuring pH and conductivity

The Type-VII combination kit consists of two instruments: the pH AGRAR 2000 for measuring pH in soil and liquids and the EC 2000 for measuring conductivity in liquids.

These two instruments are your ideal companions when monitoring the fertilization of hydroponic crops. The pH AGRAR 2000 allows you to monitor the pH. This microprocessor-controlled meter enables you to make quick and precise measurements in solutions such as irrigation water and fertilizer solutions. A glass pH piercing electrode allows you to determine the pH level directly in the soil or substratum. The meter features automatic calibration.

It displays the electrode conductivity slope for monitoring the glass pH piercing electrode. A warning tone is emitted if the sensitivity level is too low. The sturdy housing is built for the rough conditions of agricultural field work. The EC 2000 is used to measure conductivity. EC value analysis is a critical component in fertilization, soil-free cultivation, closed cultivation, hydroponics, or salt-sensitive crops.

With its ability to measure up to 200 mS/cm with the glass-platinum conductivity electrode, the EC 2000 is also suitable for monitoring basis solutions. It is temperature compensated and equipped with a specific conductivity electrode with integrated temperature probe.

TECHNICAL SPECIFICATIONS:

pH AGRAR 2000	
Measurement range:	0 to 14
Resolution:	0.01
Accuracy:	± 0.02
EC 2000	
Measurement range:	Conductivity: 0 to 20, or 200 mS/cm Temperature: +5 to +45 °C
Resolution:	Conductivity: 0.1 mS/cm Temperature: 0.1 °C
Accuracy:	Conductivity: 0 to 20 mS/cm ± 2 % 20 to 200 mS/cm ± 5 % Temperature: ± 0.2 °C
Type-VII advisory kit	
Dimensions and weight with case:	460 x 350 x 135 mm, approx. 4.5 kg

ARTICLE NO.

30001700 Type-VII advisory kit
pH, conductivity

pH AGRAR 2000 with pH piercing electrode made from glass pH 4 and pH 7 buffer solutions, KCl refill solution with filler syringe, CaCl₂ powder for analysing soil solutions, dibble rod, spray bottle with deionized water, EC 2000 with carbon conductivity electrode with mini 5-pin plug, 1.4 mS/cm and 12.88 mS/cm calibration solutions, Technical manual

30001700-P Type-VII advisory kit

Similar to the 1700, but with glass-platinum conductivity electrode for up to 200 mS/cm

ACCESSORIES

30003011 pH piercing electrode made of glass, with three diaphragms, 3 mole/l KCl, 1 metre attached cable with BNC plug

30003033 pH piercing electrode made from glass, with three diaphragms, 3 mole/l KCl, without cable

30003004 1 metre attached cable with BNC plug for pH piercing electrode made of glass Article No. 30003033

30003012 pH 4.0 buffer solution, 100 ml bottle

30003013 pH 7.0 buffer solution, 100 ml bottle

30001004 Spray bottle with deionized water

30003022 Refill solution with filler syringe for pH electrodes 3 mole/l KCl, 100 ml bottle

30003017 Dibble rod

30008102 Nitrate (each bag with 6 test strips)

30004093 Carbon conductivity electrode, 1 metre cable, temperature sensor NTC 10 K, miniature 5-pin plug

30004195 Glass-platinum conductivity electrode, 1 m cable, temperature sensor NTC 10 K, miniature 5-pin plug

30001303 Calibration solution of 1.4 mS/cm 100 ml bottle

30001308 Calibration solution of 12.88 mS/cm 100 ml bottle

30001304 Calibration solution of 111.8 mS/cm 100 ml bottle

30002014 Beaker for measuring volume, 100 ml with lid

30004444 Technical manual

30003019 One 9-volt battery, size 6LR61



MEASURING IN SOIL AND LIQUIDS

GaLaBau advisory kit type II/II+



ART.-NR.	
30001020	GaLaBau advisory kit type II pH, Aktivität PE controller with AM probe (25 cm), nitrate test strips, 100 ml beaker, Soiltester, measuring sleeve, sand paper and manuals
30001021	GaLaBau advisory kit type II+ pH, activity PET 2000 with AM probe (25 cm), nitrate test strips, 100 ml beaker, Soiltester, measuring sleeve, sand paper and manuals
ACCESSORIES	
30003020	Soil-sample measuring sleeve for the Soiltester pH meter
30003023	Sand paper
30002005	Nitrate test strips, Box with 100 strip
30008102	Nitrate (each bag with 6 test strips)
30001004	Spray bottle with deionized water
30003019	One 9-volt battery, size 6LR61



Measuring activity and pH

The GaLaBau advisory kit has been developed specifically to quickly monitor soil characteristics.

The GaLaBau advisory kit contains a PE controller (type II) or a PET 2000 (type II+) with AM probe for determining the salt content (activity) and a soil tester for determining the pH value directly in the soil.

The activity measurement is carried out in the root area; it takes into account all relevant soil properties and is displayed on a scale in grams of salt (nutrient) per litre of soil (substrate). This enables you to make an easy and precise determination of the plant's possible nutrient uptake in the soil. A lack of fertiliser or excess salt (e.g. from road salt) can be seen quickly. When measuring high salt levels, the nitrate indicator strips can be used to differentiate between accompanying salts and nitrate.

TECHNICAL SPECIFICATIONS:

Soiltester	
Measurement range:	3 to 8
Accuracy:	± 10%
Display:	multi-colour scale
PE controller	
Measurement range:	0 to 1 g/l
Display:	multi-colour scale
PET 2000	
Measurement range:	0 to 2 g/l
Resolution:	0.01 g/l
Accuracy:	± 0.02 g/l
GaLaBau advisory kit	
Dimensions and weight with case:	370 x 290 x 90 mm approx. 2.9 kg

MEASURING IN SOIL AND LIQUIDS

Advisory kit type X, type VI



For measuring activity, pH and conductivity

The Type-X combination kit consists of three instruments: the PET 2000 for measuring soil activity (in g salt/l); the pH AGRAR 2000 for measuring soil or liquid pH values; and the EC 2000 for measuring the conductivity in liquids.

The PET 2000 allows you to determine the activity or total salt content (in grams of salt per litre) in the soil or substratum. The activity is determined by the amount of dissolved salts contained in the soil. The mobility of the salts is dependent on the humidity, temperature and density of the soil. This allows nutrient salts that are available to plants (such as nitrate or potassium) to be fully measured. This provides you with a concise overview of what nutrient salts are available to plants in the root zone.

The pH AGRAR 2000 is also included for monitoring the pH value. This microprocessor-controlled meter enables you to make quick and precise measurements in solutions such as irrigation water and fertilizer solutions. A glass pH piercing electrode allows you to determine the pH level directly in the soil or substratum. The meter features automatic calibration. It displays the electrode conductivity slope for monitoring the glass pH piercing electrode. A warning tone is emitted if the sensitivity level is too low. The sturdy housing is built for the rough conditions of agricultural field work.

The EC 2000 conductivity meter completes this instrument kit.

EC value analysis is a critical component in fertilization, soil-free cultivation, closed cultivation, hydroponics, or salt-sensitive crops.

With its ability to measure up to 200 mS/cm, the EC 2000 is also suitable for monitoring basis solutions. It is temperature compensated and equipped with a specific conductivity electrode with integrated temperature probe.

TECHNICAL SPECIFICATIONS:

pH AGRAR 2000	
Measurement range:	0 to 14
Resolution:	0.01
Accuracy:	± 0.02
EC 2000	
Measurement range:	Conductivity: 0 to 20, or 200 mS/cm Temperature: +5 to +45 °C
Resolution:	Conductivity: 0.1 mS/cm Temperature: 0.1 °C
Accuracy:	Conductivity: 0 to 20 mS/cm ± 2 % 20 to 200 mS/cm ± 5 % Temperature: ± 0.2 °C
PET 2000	
Measurement range:	0 to 2 g/l
Resolution:	0.01 g/l
Accuracy:	± 0.02 g/l
Type-X advisory kit	
Dimensions and weight with case:	460 x 350 x 135 mm; 4.9 kg

ARTICLE NO.	
30001010	Advisory kit, type X pH, conductivity, activity pH AGRAR 2000 with pH glass piercing electrode, buffer solutions pH 4 and pH 7, KCl filling solution with filling syringe, CaCl ₂ powder for analysis in soil solutions, dibble rod, spray bottle with deionized water, PET 2000 with AM probe (25 cm) with mini DIN plug (8-pin), 6 nitrate test strips, EC 2000 with carbon conductivity electrode with miniature plug (5-pin), calibration solutions of 1.4 mS/cm and 12.88 mS/cm, Technical manual
30001010-P	Advisory kit, type X pH, conductivity, activity Similar to the 30001010, but with glass/platinum conductivity electrode for up to 200 mS/cm
30001600	Advisory kit type VI Conductivity, activity similar to 30001010, but without pH Agrar 2000
30001600-P	Advisory kit type VI Conductivity, activity Similar to the 30001600, but with glass/platinum conductivity electrode for up to 200 mS/cm
ACCESSORIES	
30003011	pH piercing electrode made of glass, with three diaphragms, 3 mole/l KCl, 1 metre attached cable with BNC plug
30003012	ph 4.0 buffer solution, 100 ml bottle
30003013	ph 7.0 buffer solution, 100 ml bottle
30000504	Calcium chloride [CaCl ₂] for soil analysis (approx. 11.1 g for 10 l solution 0.01 mole/l)
30000505	Calcium chloride [CaCl ₂] for soil analysis (approx. 100 g)
30001004	Spray bottle with deionized water
30003022	Refill solution with filler syringe for pH electrodes 3 mole/l KCl, 100 ml bottle
30003017	Dibble rod
30001003	AM probe (25 cm), 1 metre cable with mini-DIN 8-pin plug
30002005	Nitrate test strips, Box with 100 strips
30008102	Nitrate (each bag with 6 test strips)
30004093	Carbon conductivity electrode, 1 metre cable, temperature sensor NTC 10 K, miniature 5-pin plug
30004195	Glass-platinum conductivity electrode, 1 metre cable, temperature sensor NTC 10 K, miniature 5-pin plug
30001303	Calibration solution, 1.4 mS/cm 100 ml bottle
30001308	Calibration solution, 12.88 mS/cm 100 ml bottle
30001304	Calibration solution, 111.8 mS/cm 100 ml bottle
30002014	Beaker for measuring volume, 100 ml with lid
30004444	Technical manual
30003019	One 9-volt battery, size 6LR61

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CHAPTER

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MEASURING IN SOIL AND LIQUIDS

MULTI ISE


MULTI ISE for determining the individual nutrients of ammonium, potassium and nitrate in soil solutions and ions in aqueous solutions

The Multi ISE is the versatile, robust multi-purpose tool for measuring the ion content in fluids. No filtration or clarification of the measured solution is required. Turbidity or discolouration do not affect the measurement results.

You can use the MULTI ISE to determine the pH as well as concentrations across a wide concentration range for the following ions in aqueous solution: ammonium NH_4^+ , nitrate NO_3^- , potassium K^+ , sodium Na^+ , calcium Ca^{2+} , fluoride F^- , chloride Cl^- , bromide Br^- , iodide I^- , silver Ag^+ , copper Cu^{2+} , or nitrite NO_2^- .

This measuring instrument can measure contents in the mg/l (ppm) range, so there is no need to dilute the measured solution. The result is shown on the display in g/l with an accuracy of 0.001 g/l (1 mg/l). These concentrations can be determined with a precision level of $\pm 5\%$ of the measured value.

The MULTI ISE can also measure the individual nutrient ions most critical for agriculture: ammonium (NH_4^+), potassium (K^+) and nitrate (NO_3^-). Measurements can be made in fertilizer solutions, soil solutions (extracts), plants and organic material. The nutrients can be measured directly in the fertilizer solution.

A simply slurry solution made with deionized water (or better yet, an extraction solution recommended by LUFA – the German Agricultural Testing and Research Institute) will suffice to determine the ion concentrations in substrata and soils. An extraction solution consisting of alum $\text{KAl}(\text{SO}_4)_2$ is used for nitrate. For ammonium and potassium, an extraction solution of calcium chloride CaCl_2 is used.

The MULTI ISE is microprocessor-controlled and easy to use. The corresponding electrode (ammonium, nitrate or potassium) is first connected to the instrument and then immersed together with the reference electrode into the solution being measured. The instrument references the on-board calibration data corresponding to that measurement.

The menu-driven calibration process is self-explanatory. The required calibration solutions and the Technical manual are included in the kit.

The enclosure is waterproof (resistant to splashed water).

TECHNICAL SPECIFICATIONS:

Measured quantities:	ammonium NH_4^+ , nitrate NO_3^- , potassium K, sodium Na, calcium Ca, fluoride F, chloride Cl, bromide Br, iodide I, silver Ag, copper Cu, nitrite NO_2^-
Measuring range:	up to min. 10 g/l
Accuracy:	$\pm 5\%$
Display:	LCD
Operating temperature:	During operations: $+5$ to $+45\text{ }^\circ\text{C}$
Power supply:	One 9-volt battery, size 6LR61
Run time:	approx. 100 hours
Degree of protection:	IP 40
Dimensions and weight:	125 x 75 x 45 mm, 190 g
Dimensions and weight with case:	460 x 350 x 135 mm, approx. 5.0 kg

ARTICLE NO.	
30001901 MULTI ISE	Base unit without electrode
30001900 MULTI ISE advisory kit	with ammonium, potassium and nitrate electrodes
	with calibration solutions, refill solution for electrodes with filler syringe, conditioning solutions, powder for extraction solutions, spray bottle with deionized water and manual
ACCESSORIES	
40118006	Ammonium selective electrode
40114006	Nitrate selective electrode
40134006	Potassium selective electrode
40136006	Sodium selective electrode
40102006	Calcium selective electrode
40110006	Fluoride selective electrode
40104006	Chloride selective electrode
40100006	Bromide selective electrode
40106006	Iodide selective electrode
40116006	Silver selective electrode
40112006	Copper selective electrode
40138006	Nitrite selective electrode
40126006	Reference electrode, double bridge
30003035	ISE/Reference cable, 1 m
30001904	Calibration solution 180 mg/l NO_4 , 100 ml bottle
30001905	Calibration solution 18 mg/l NO_4 , 100 ml bottle
30001917	Calibration solution 620 mg/l NO_3 , 100 ml bottle
30001916	Calibration solution 62 mg/l NO_3 , 100 ml bottle
30001906	Calibration solution 390 mg/l K, 100 ml bottle
30001907	Calibration solution, 39 mg/l K, 100 ml bottle
30002027	Refill solution with filling syringe for electrodes of 0.1 mole/l KCl, 100 ml bottle
30001908	Conditioning solution for NH_4 (1 mole/l NH_4Cl), 50 ml bottle
30002024	Conditioning solution for K and NO_3 (1 mole/l KNO_3), 50 ml bottle
30000504	Calcium chloride $[\text{CaCl}_2]$ for soil analysis (approx. 11.1 g for 10 litres of 0.01 mole/l solution)
30002035	Alum powder for 5 l extraction solution for NO_3 , 50 g
30001004	Spray bottle with deionized water
30003019	One 9-volt battery, size 6LR61
	Other calibration solutions are available on request.

MOBILE NUTRIENT ANALYSIS

Possible steps in the process

HOMOGENIZATION



1a) Use sieves to homogenize the soil sample



and weigh the soil sample to determine the nutrient content in mg/kg

SINGLE SAMPLE
SUBSTRATE

1b) Measure the sample volume with the graduated sample container (e.g. for horticulture gardening substrata)

SINGLE SAMPLE
MINERAL SOILS

1c) Measure the sample volume with the graduated sampling auger (e.g. for mineral soils)



2) Add an extraction agent to the sample



3) Extract by repeated shaking



4) Filter the extract using a round filter



5) Measure the filtrate with a graduated plastic syringe



6) Fill the measuring cuvette



7) Add a defined number of drops of the colour reagent



8) Add the reactant



9) Insert the cuvette into the AMOLA® base unit. Read the measured value directly in kg/ha (for mineral soils) or mg/l_{Substrate} (for substrates), or ...

Hand model: Sarah Tobehn

Measurement range*

	Mineral soils		Horticulture substrates	Water samples	Accuracy
Parameter	kg/ha	mg/kg	mg/l of substrate	mg/l	%
NH ₄	4 – 80	1 – 26	13 – 260	> 0.1	± 5
NH ₄ -N	3 – 60	1 – 20	10 – 200	> 0.1	± 5
NO ₃	130 – 1,850	40 – 620	90 – 1,230	> 4	± 10
NO ₃ -N	30 – 420	10 – 140	20 – 280	> 1	± 10
PO ₄	180 – 4,500	60 – 1,500	60 – 1,500	> 0.6	± 1
PO ₄ -P	60 – 1,500	20 – 500	20 – 500	> 0.2	± 1
P ₂ O ₅	138 – 3,450	46 – 1,150	46 – 1,150	> 0.5	± 1
K	120 – 900	40 – 300	40 – 300	> 2	± 5
K ₂ O	144 – 1,080	48 – 360	48 – 360	> 2.5	± 5

* For higher levels out of the measurement range (e.g. 500 mg/l NO₃-N), you should dilute the filtrate with distilled water (e.g. 1:2). The measured result must then be multiplied by the dilution factor (e.g. 250 mg/l measured x 2 = 500 mg/l)

Contents of the AMOLA® AGRAR MOBILE LAB case:

Case, Amola base unit, sampling auger, sieve, drip pan, shovel, spatula, scale with weight, filter, measuring cylinder (100 ml), measuring cup (250 ml), funnel, bottle (0.5 l), sample vessels (15 and 50 ml), syringe (5 ml), four glass cuvettes, 1 litre of CaCl₂, 2 x 1 litre of CAL, 1 litre of distilled water, nitrite test strips, Viscolor test for ammonium, nitrate, phosphate and potassium, sedimentation tube, glass tamper, pyrophosphate solution

MOBILE NUTRIENT ANALYSIS

AMOLA® AGRAR MOBILE LAB with accessories



Using the AMOLA® for photometric determination of NPK

The AMOLA® Agrar Mobile Lab contains all the key reagents, equipment and accessories that you need to make a quick, easy and reliable assessment in the lab or in the field. It can be used to determine any of the main readily soluble, plant-available nutrients: nitrogen, phosphorus and potassium (NPK). It is useful for agriculture, horticulture, tree nurseries and composting plants applications. Consultants and plant production specialists also make use of the AMOLA®.

After a sample is taken, the ammonium NH_4 , nitrate NO_3 , potassium K and phosphate PO_4 in the soil are converted by extraction into liquids and treated with a specific colour reagent. The intensity of the colour indicates the quantity found in the soil of each of these substances.

The AMOLA® base unit provides you with an objective determination of the colour intensity. The sample type (e.g. mineral soil, substrate, water) and the desired soil component are first specified – then the desired measurement is displayed using the relevant units. For mineral soils, the displayed unit is kg/ha (kilograms per hectare) or mg/kg soil (milligrams per kilogram). For horticulture substrates the unit is in mg/l of substrate (milligrams per litre), and for water samples the unit is mg/l (milligrams per litre).

Ammonium can be specified as NH_4 and NH_4 ; nitrate can be specified as NO_3 and NO_3 -N. The total nitrogen is determined from the sum of the ammonium- and nitrate-nitrogen (NH_4 -N + NO_3 -N). Phosphate is calculated as PO_4 , PO_4 -P or P_2O_5 ; potassium is calculated as K or K_2O .

The manual (included here) uses simple illustrations to describe the sampling, processing, extraction and analysis methods.

TECHNICAL SPECIFICATIONS
for the photometer:

Type:	LED photometer: microprocessor controlled, with auto-test and auto-calibration
Lens optics:	LED + 2 inference filters
Wavelengths:	450 nm (NO_3 -N), 660 nm (NH_4 -N, PO_4 -P, K)
Accuracy:	± 2 nm, half-width of 10 to 12 nm
Cuvette holder:	Round cuvettes with 16 mm outer diameter Insensitive to ambient light Measurements with uncovered cuvette shaft are possible
Detector:	Silicon photocell
Display:	Illuminated graphical display, 64 x 128 pixels
Usage:	Easy to use with icons on the display Pre-programmed tests for VISOCOLOR® ECO tests Result with dimension specification, date, time
Data memory:	50 measurements
Interface:	Mini USB Free software updates via internet / PC
Operating range:	5 – 50 °C at 90 % relative humidity
Power supply:	Three AA batteries, rechargeable batteries USB interface; optional internal battery pack
Housing:	Waterproof, IP 67 (30 min, 1 m)
Dimensions and weight of case:	550 x 410 x 180 mm, approx. 10.2 kg

ARTICLE NO.	
30001806	AMOLA® AGRAR MOBILE LAB with accessories Contents: see box at left side
30001828	AMOLA® AGRAR MOBILE LAB, base unit
	ACCESSORIES
30005001	Volume sampling auger with scale
30002049	25-ml plastic shovel
30002057	Spatula
30000810	Soil strainer with wooden frame, 2 mm / 330 x 190 mm with drip pan
30004066	High-precision scale: 0 – 500 g with calibration weight
30002006	100 round (ø 150 mm) filters
30000570	Graduated measuring cylinder, 100 ml
30002044	Graduated measuring cup, 250 ml
30002043	Powder funnel, ø 80 mm
30002029	Wide-neck extraction bottle, 0.5 litre, with top
30002058	50-ml graduated sample container, with screw cap
30002059	15-ml graduated sample container, with screw cap
30002060	Plastic syringe, 5 ml, with 0.2 ml graduated scale
30002061	Four 10-ml glass cuvettes, with screw cap
30001876	CaCl_2 extraction concentrate, 1 litre rectangular bottle
30001877	CAL extraction concentrate, 1 litre rectangular bottle
30002091	Distilled water, 1 litre rectangular bottle
30002070	Nitrite test strips, Quantofix (100 tests)
30002092	Two measuring spoons for Visocolor tests,
30001886	Visocolor® ECO ammonium 3 (approx. 50 tests)
30001895	Visocolor® ECO nitrate (approx. 110 tests)
30001889	Visocolor® ECO phosphate (approx. 80 tests)
30001883	Visocolor® ECO potassium (approx. 60 tests)
30002093	Sedimentation tube
30002095	Glass tamper for the sedimentation analysis
30002096	Pyrophosphate solution for the sedimentation analysis

MOBILE NUTRIENT ANALYSIS

STELZNER® soil kit – Preparing the sample



Mobile nutrient analysis in the field.

The STELZNER® soil kit includes all instruments and accessories required for producing the soil extracts and the subsequent determination of phosphate (P), soil structure, potassium (K), pH, ammonium, nitrite and nitrate (N). The soil extracts are produced either with a calcium-acetate-lactate (CAL) solution (for determining P and K) or with a CaCl_2 solution (for determining N and pH).

If your national soil-analysis regulations or local geological conditions require, the STELZNER® soil kit can also be equipped with extraction solutions other than CaCl_2 or CAL.

The detailed instructions make it easy to carry out on-site analysis of the nutrients. Depending on your requirements, there are different reagents, indicators and instruments available to determine your key nutrients. The AMOLA® (refer to pages 19 and 52 for comparison to other photometers) allows you to precisely analyse weak concentrations and a variety of other materials. Reagents and indicators are very useful for making speedy determinations directly in the field.

The NITRAT 2000 (refer to page 22) and the Nitra-chek (refer to page 23) are excellent choices for measuring nitrate.

Contents of the STELZNER® soil kits

Case, sampling auger, 4-mm strainer with drip pan, precision scale, spray bottle with deionized water, two funnels, 100 fluted filters, four extraction bottles, 100-ml beaker, two 250-ml beakers and two 400-ml beakers, six volume-measuring beakers with covers, 500-ml screw-top can, plastic syringes, glass stirring rods, four 0.5-litre extraction bottles, two plastic shovels, metal scoop, cuvette cell stand with 18 empty 1-litre reagents, Extraction concentrates CaCl_2 and CAL



NUTRIENT ANALYSIS

CHAPTER 6

MOBILE NUTRIENT ANALYSIS

Reagents and indicators



Reagents and indicators for performing nutrient analysis in the field.

As a supplement to the soil kit, a variety of VISOCOLOR® reagents or indicators (see page 21) can be used to carry out simple soil analysis in the field. Contact us for more information concerning these additional possibilities for analysis. There are a variety of methods available to suit your individual requirements and required level of precision.



ARTICLE NO.	
30001875	STELZNER® soil kits
	ACCESSORIES
30001876	CaCl_2 extraction concentrate, 1 litre bottle, for producing the extraction solution
30001877	CAL extraction concentrate, 1 litre bottle, for producing the extraction solution
30002033	100 fluted filters for the analysis process, \varnothing 240 mm
30002026	Cuvette cell stand 18-x, incl. sample bottle with lid
30000810	Soil strainer with wooden frame, 2 mm / 330 x 190 mm with drip pan
30000820	Drip pan for soil strainer
30002031	Powder funnel, \varnothing 120 mm
30002043	Powder funnel, \varnothing 80 mm
30002042	Liquid funnel, \varnothing 80 mm
30002030	Wide-neck extraction bottle, 1.0 l, with top
30002029	Wide-neck extraction bottle, 0.5 l, with top
30000570	Graduated cylinder, 100 ml, PE, tall shape
30002044	Graduated measuring cup, 250 ml
30002045	Graduated measuring cup, 500 ml
30002046	Screw-top can, 500 ml
30002048	Glass stirrer, \varnothing 10 mm, approx. 15 cm
30002049	Plastic scoop, 25 ml
30002051	Metal scoop, flat surface and spoon

ARTICLE NO.	
30001861	VISOCOLOR® ECO Test kit with colour disc, Potassium 2 mg to 15 mg/l K, approx. 60 tests
30001862	VISOCOLOR® ECO Test kit with colour disc, Ammonium 0.2 to 3.0 mg/l NH_4 , approx. 50 tests
30001863	VISOCOLOR® ECO Test kit with colour disc, Phosphate 0.2 mg to 5 mg/l PO_4 , approx. 80 tests
30001864	VISOCOLOR® ECO Test kit with colour disc, Nitrate 1 mg to 120 mg/l NO_3 , approx. 110 tests
	Indicators: refer to page 21

MEASURING INDIVIDUAL COMPONENTS

Indicators



30008204



Additional
components or
custom packs
are available on
request.



Quick test

Our non-bleeding indicator sticks are used for taking quick and easy measurements of various parameters in soil solutions and water.

Additional components or custom packs are available on request.

Optional special packages including:

- 6 test strips in a bag,
- 50 bags with 6 test strips each, in a box
- or 150 bags with 6 test strips each, per carton.

TECHNICAL SPECIFICATIONS:

Measurement range:	Ammonium NH_4
Divisions:	0 – 10 – 25 – 50 – 100 – 200 – 400 mg/l
Measurement range:	Calcium Ca
Divisions:	0 – 10 – 25 – 50 – 100 mg/l
Measurement range:	Carbonate hardness
Divisions:	0 – 3 – 6 – 10 – 15 – 20 °d
Measurement range:	Chloride Cl
Divisions:	0 – 500 – 1,000 – 2,000 – 3,000 mg/l
Measurement range:	Chlorine Cl_2
Divisions:	0 – 0.1 – 0.5 – 1 – 3 – 10 mg/l
Measurement range:	Iron Fe
Divisions:	0 – 2 – 5 – 10 – 25 – 50 – 100 mg/l
Measurement range:	Potassium K
Divisions:	0 – 200 – 400 – 700 – 1,000 – 1,500 mg/l
Measurement range:	Copper Cu
Divisions:	0 – 10 – 30 – 100 – 300 mg/l
Measurement range:	Nitrate NO_3
Divisions:	0 – 10 – 25 – 50 – 100 – 250 – 500 mg/l

Measurement range:	Nitrate NO_3 / Nitrite NO_2
Divisions:	0 – 10 – 25 – 50 – 100 – 250 – 500 mg/l
Measurement range:	Nitrite NO_2
Divisions:	0 – 1 – 5 – 10 – 20 – 40 – 80 mg/l
Measurement range:	pH test
Divisions:	0 to 14 with 1-pH divisions
Measurement range:	pH test
Divisions:	2 to 9 with 0.5-pH divisions
Measurement range:	Phosphate PO_4
Divisions:	0 – 3 – 10 – 25 – 50 – 100 mg/l
Measurement range:	Water hardness
Divisions:	< 3 > 5 > 10 > 15 > 20 > 25 °d
Measurement range:	Hydrogen peroxide H_2O_2
Divisions:	0 to 2.5 mg/l
Measurement range:	Zinc Zn
Divisions:	0 – 10 – 25 – 50 – 100 mg/l
Multi-sticks for aquarium use:	
Total hardness: 5° to 25° d	
Carbonate hardness: 3° to 20° d	
pH: 6.4 to 8.4	



CUSTOM PACKS

ARTICLE NO.	
30002071	Ammonium* (100 tests)
30002073	Calcium* (60 tests)
30002074	Carbonate hardness (100 tests)
30002072	Chloride (100 tests)
30002068	Sensitive chlorine (100 tests)
30002075	Iron (100 tests)
30002076	Potassium* (100 tests)
30002077	Copper (100 tests)
30002085	Multi-stick for aquarium usage (100 tests)
30002005	Nitrate Merckoquant (100 tests)
30002069	Nitrate/Nitrite (100 tests)
30002070	Nitrite (100 tests)
30002083	pH test 0 – 14 (100 tests)
30002084	pH test 2 – 9 (100 tests)
30002078	Phosphate* (100 tests)
30002082	Water hardness (100 tests)
30002079	Hydrogen peroxide (100 tests)
30008400	Oil test (100 tests)
30002080	Zinc* (100 tests)

* Test strips with reagents

CUSTOM PACKS

30008200	pH test 0 – 14 (150 bags, each with 6 test strips)
30008202	pH test 0 – 14 (each bag with 6 test strips)
30008203	pH soil test kit (4 bags with 6 test strips each, beaker, 20 circular filters, funnel)
30008204	Nitrate/pH soil test kit (four bags nitrate and four bags pH, with 6 test strips, beaker, 20 round filters, funnel)
30008302	Water hardness (each bag with 6 test strips)
30008102	Nitrate (each bag with 6 test strips)
30008402	Oil test (each bag with 6 test strips)
30008602	Hazardous substance test
30008502	Indicator set (Bags of nitrate, water hardness and pH, each with 6 test strips)



NITRATE DETERMINATION

NITRAT 2000

"Accuracy: very good"
 "Time needed:
 5 min. for preparation and
 calibration; minimal time for
 several measurements"
 According to the Saxon German
 State Office for Environment,
 Agriculture and Geology;
 pub. series
 issue 10/2009



30002019

NITRAT 2000 advisory kit

This straight-forward, microprocessor-controlled meter uses an ion-selective electrode to measure the nitrate concentration in a liquid. A simple slurry can be made with extraction solution in order to measure substrata and soil. Turbidity does not have an effect on the measurement results. Nitrate contents up to 1000 mg/L (ppm) can be accurately measured.

This eliminates the possibility of errors caused by dilution. A nitrate combination electrode can be used for the measuring system. The calibration should be carried out with our calibration solution (included). We recommend that you use our Nitrat 2000 Advisory Kit when preparing your test samples (art. no. 2011). It contains all the necessary accessories, as listed below.

NITRAT 2000 soil kit

Soil kit for simple and quick determination of the nitrate content in the field.

The NITRAT 2000 is easy to use and delivers quick reliable results. The meter and accompanying instructions allow you to measure the nitrate content in soil, plants, or organic material. The NITRAT 2000 soil kit includes all necessary instruments and auxiliary materials. The detailed instructions accompanying the kit describe how to take samples and carry out measurements. They include examples and related reference information.

TECHNICAL SPECIFICATIONS:

Measurement range:	NO ₃ : 0 to 1,000 mg/L
Resolution:	NO ₃ : 1 mg/L
Accuracy:	NO ₃ : ± 5 %
Display:	Liquid crystal display
Operating temperature:	During operations: +5 to +45 °C
Power supply:	One 9-volt battery, size 6LR61
Run time:	approx. 100 hours
Degree of protection:	IP 40
Dimensions and weight:	125 x 75 x 45 mm, 190 g

Advisory kit

Dimensions and weight with case: 370 x 290 x 90 mm,
approx. 3.2 kg

Soil kit

Dimensions and weight with case: 550 x 410 x 180 mm,
approx. 4.5 kg

ARTICLE NO.	
30002008	NITRAT 2000
	Base unit without electrode
30002019	NITRAT 2000 soil kit
	NITRAT 2000 with nitrate electrode, 100 ml each of calibration solutions 500 and 50 mg/L NO ₃ , 100 ml refill solution of 0.1 mole KCl with filler syringe, 100 ml conditioning solution, salt for extraction solution/alum, spray bottle with deionized water, beaker
30002011	NITRAT 2000 soil kit
	NITRAT 2000 with nitrate electrode, 100 ml each of calibration solutions 500 and 50 mg/L NO ₃ , 100 ml refill solution (0.1 mole KCl) with filler syringe, 100 ml conditioning solution, salt for extraction solution/alum, spray bottle with deionized water, 1 litre beaker, hand mixer, electronic precision scale, fluted filter, strainer with drip tray, six powder funnels (Ø 120 mm), six extraction bottles (0.5 litre), beaker, plastic scoop
ACCESSORIES	
40180101	Nitrate selective combination electrode 1-meter attached cable, BNC plug
30002024	Conditioning solution, 1 mole/L KNO ₃ , 50 ml bottle
30002014	Beaker for measuring volume, 100 ml with lid
30002018	Calibration solution 500 mg/L NO ₃ , 1 l bottle
30002023	Calibration solution 50 mg/L NO ₃ , 1 l bottle
30002027	Refill solution with filler syringe for nitrate electrodes, 0.1 mole/L KCl, 100 ml bottle
30002028	Calibration solution 500 mg/L NO ₃ , 100 ml bottle
30002031	Powder funnel, Ø 120 mm
30002033	100 fluted filters (Ø 240 mm) for analysis
30002049	Plastic scoop, 25 ml
30002034	Calibration solution 50 mg/L NO ₃ , 100 ml bottle
30002035	Salt for 5 l extraction solution/alum
30002036	Extraction solution/alum, 1 l bottle
30001004	Spray bottle with deionized water
30001009	Hand mixer
30000810	Soil strainer with wooden frame, 2 mm / 330 x 190 mm with drip pan
30003019	One 9-volt battery, size 6LR61

30002011



Similar to illustration



NITROGEN QUICK TEST

Filter beaker



N-min nitrogen quick test

This straight-forward set is used for manually determining the nitrogen content. It includes a filter beaker for outdoor soils and substrate, 50 round filters, 100 nitrate test strips, a 100-ml beaker and a 100-ml funnel. Tables and worksheets for N-outdoors, N-substrata and N-sap are also included.

Worksheets for N-outdoors, N-substrata and N-sap.

ARTICLE NO.	
30002000	Filter beaker for N-min nitrogen quick test
30002001	Supplemented with pH test strips and tables

AGROS NOVA



Meter for liquid manure

This measuring instrument allows you to determine the nitrogen content in your liquid manure. Measurements can be made in the field or at your farm in a matter of minutes. Our nitrogen measuring system makes targeted manure fertilization possible. The TS and phosphorus content can also be calculated.

ARTICLE NO.	
30002016	AGROS NOVA measuring instrument for liquid manure
	AGROS NOVA complete in case, with reagent, pH booster, areometer (density hydrometer) and measuring spoon
ACCESSORIES	
30002097	Reagent, pH booster

NITRATE QUICK TEST

Hand-held sampling pliers



Obtaining plant sap

The hand-held sampling pliers are mainly used for obtaining sap from plant parts and assessing the second N-fertilization for winter grains.

TECHNICAL SPECIFICATIONS:

Material:	Stainless steel precision manufactured
Weight:	485 g
Length:	170 mm
Compressed surface:	24 x 22 mm

ARTICLE NO.	
30002007	Hand-held sampling pliers

NITRATE AND NITROGEN MEASUREMENTS

CHAPTER 7

NITRATCHEK ADVISORY KIT N/MIN ANALYSIS

Nitrate/nitrogen advisory kit, NO₃-N

Measuring nitrates in fruits, plant materials and soil

Measuring instrument for electronically evaluating the colour scale on Merckoquant nitrate test strips.

The "Nitrachek" system has established itself as an indispensable tool in many countries. New: The previous 20 measurements are saved with date and time stamps. There is a new automatic corrective-factor multiplication feature. When used properly, the Nitrachek delivers results with a statistical stray zone of about ± 10 % accuracy. This is a respectable value for this application range.

TECHNICAL SPECIFICATIONS:

Dimensions and weight of case: 550 x 410 x 180 mm,
approx. 6.6 Kg

For determining the nitrate content in soil

The nitrate-nitrogen advisory kit allows you to carry out quick on-site tests to determine the nitrate content in fruits and plant material. It is important to determine the proper amount of nitrogen needed at the correct time for your crops.

The instruction manual includes safety tips and practical recommendations for working with soils (N_{min}) with varying depths and when working with water, vegetables, potatoes, grains, corn, sugar beets or grasses. The quantity and quality of your crop will both suffer if you use too little or too much nitrogen. With our nitrate-nitrogen advisory kit, you can accurately determine the proper fertilization schedule for your crops.



ARTICLE NO.	
30002002	Nitrate/nitrogen advisory kit
ACCESSORIES	
30002009	Scope of delivery: Reflectometer, Nitrachek, calibration solution 100 mg/L NO ₃ (20 ml), 1 bag of 6 nitrate test strips, operating instructions
30002010	Calibration solution 100 mg/L NO ₃ , 20 ml bottle
30002005	Nitrate test strips, Box with 100 strips
30002006	100 round (ø 150 mm) filters
30002030	Wide-neck extraction bottle, 1.0 l, with top
30002014	Beaker for measuring volume, 100 ml with lid
30002012	Manual and operating instructions
30002550	8 reaction vessels with stands and dosage syringe
30000810	Soil strainer with wooden frame, 2 mm / 330 x 190 mm with drip pan
30002020	Timer
30002021	Brush for cleaning strainer
30002022	10 sample beakers
30002040	Beaker, 1 litre, with graduation marks
30002047	Plastic syringe, 10 ml
30003019	One 9-volt battery, size 6LR61
30004060	Manual pointer scale
30005004	Sampling auger, 30 cm

MEASURING FOOD

Refractometers



For wine, honey, fruit juices and alcohol

Refractometers are precise optical instruments for measuring dissolved materials in water-based solutions. Their functionality is based on the principle of varying optical refraction in liquids: light travels through a liquid and the angle of refraction is measured against a scale. This indicates the quantity of dissolved solids in the liquid.

It's easy to use: simply apply one drop of the sample liquid on the prism and then read the results right away on the scale. The device is very easy to calibrate. The visual focus is adjustable. The refractometer (ATC) is temperature compensated at 20°C.

The MR200ATC is used to determine the must or sugar content in the fruit and wine-making industries. It can also be used to determine the degree of ripening for fruits such as tomatoes, melons or kiwis. The MR90ATC can be used to determine the water and sugar content in honey.

The model MRHW25ATC is suitable for measuring alcohol; the expected alcohol content can then be estimated.

- Additional versions are available on request.

TECHNICAL SPECIFICATIONS:

MR200ATC

Measurement range: 0 to 140 °Oe, 0 to 25 °KMWBabo, 0 to 32 % Brix

Resolution: 1 °Oe, 0.2 °KMWBabo, 0.1 % Brix

Accuracy: ±1 °Oe, ±0.2 °KMWBabo, ±0.1 % Brix

Dimensions and weight: 175 x 30 mm, approx. 165 g

MR90ATC

Measurement range: 58 to 90 %, 38 to 43 Be°, 12 to 27 % water

Resolution: 0.5 %, 0.5 Be°, 1 %

Accuracy: ± 5 %, ± 0.5 Be°, ± 1 %

Dimensions and weight: 175 x 30 mm, approx. 165 g

RHW-25ATC

Measurement range: 0 – 25% potential alcohol (NOT finished alcohol!), 0 – 40% Brix

Resolution: 0.2% Al, 0.20% Brix

Accuracy: ± 0.2% Al, ± 0.20% Brix

Dimensions and weight: 175 x 30 mm, approx. 165 g

ARTICLE
NO.

30004041 MR200ATC refractometer

30004049 MR90ATC refractometer

30004106 MRHW25ATC refractometer

Digital Refractometer



For wine, honey and fruit juices

The digital refractometer is an optical instrument used to measure the specific gravity (in Brix) of water-based solutions (such as fruit juice or wine). It features automatic temperature compensation (ATC).

The measurement procedure is simple and quick. After a simple device calibration is carried out using deionized water, the sample can be measured. The measurement is then displayed within seconds in % Brix.

With the digital refractometer you avoid the measurement inaccuracies that occur with mechanical instruments. It is also quite easy to bring and put to use anywhere on-site. The temperature is displayed alongside of a battery-change indicator and other helpful information.

Conversion tables for specific gravities (in Oechsle degrees), g/l sugar, alcohol content and KMW/Babo measurements are included. A practical carrying case is also included.



TECHNICAL SPECIFICATIONS:

Measurement range: Brix: 0 to 85 %
Temperature: 0 to +85 °C

Resolution: Brix: 0.1%
Temperature: 0.1 °C

Accuracy: Brix: ± 0.2 %
Temperature: ± 0.3 °C

Operating temperature: 10 to +40 °C

Power supply: One 9-Volt AA battery

Run time: approx. 5000 measurements

Degree of protection: IP 65

Dimensions and weight: 192 x 102 x 67 mm,
approx. 420 g

ARTICLE
NO.

30004045 Digital refractometer
with case

MEASURING THE RIPENESS STAGE

Fruit penetrometer



Monitoring the degree of ripeness

The fruit penetrometer is used to monitor the ripeness stage and to check the consistency of the inner fruit flesh. It is very useful in the field for determining the best harvest time. Moreover, it can be used for quality control during storage or after transport. A variety of versions are available for different types of fruit. The standard version can be used for measuring fruits such as apples, pears or citrus. Custom versions (for example, for nuts) are available on request.

TECHNICAL SPECIFICATIONS:

Measurement range: 13 kg or 29 lb

Resolution: 0.1 kg or 0.25 lb

Accuracy: ± 1% meas.range end value at 20 °C

Puncture tips: 1 cm², 0.5 cm²

Dimensions and weight: 112 x 59 x 24 mm,
approx. 106 g

Dimensions and weight with pouch: 146 x 74 x 33 mm,
approx. 250 g



ARTICLE
NO.

30004610 Fruit penetrometer

Base unit with 2 puncture tips, splatter guard,
peeler and pouch



MEASURING FRUIT SIZE

Fruit rings/sorting templates



Size determination with sorting templates

Sorting templates as multi-part compartments, with specific circumferences, for quickly determining fruit size.

ARTICLE NO.	
30004620	Sorting calibre 10 – 55 mm 10-section compartments, stainless steel, ±0.5 mm, 5 mm steps
30004621	Sorting calibre 60 – 110 mm 11-section compartments, stainless steel, ±0.5 mm, 5 mm steps
30004622	Sorting calibre 30 – 70 mm 11 compartments, aluminium, 5 mm steps

Potato template



Size determination with sorting templates

Potato sorting template, as multi-section compartments, with specific circumferences for quickly determining size.

TECHNICAL SPECIFICATIONS:

Measurement precision:	± 0.5 mm
Material:	Stainless steel
Measuring slots:	30 to 70 mm
Compartments	11 sections

ARTICLE NO.	
30004623	Potato template

Calibre for sorting asparagus



For measuring asparagus stalks

For measuring the length and thickness of asparagus stalks.

TECHNICAL SPECIFICATIONS:

Colour:	white asparagus: white green asparagus: black
Measurement precision:	± 0.5 mm
Material:	Plastic
Measuring slots:	White asparagus: 10, 12, 14, 16, 18, 26, 36 mm Green asparagus: 3, 6, 8, 10, 12, 14, 16, 18, 20, 26, 36 mm
Determination of length:	for white asparagus: 12, 17, 22 cm for green asparagus: 10, 12, 17, 22, 27 cm

ARTICLE NO.	
30004640	Calibre for sorting asparagus Green asparagus
30004641	Calibre for sorting asparagus White asparagus
	Sorting templates for tomatoes, soft fruits, nuts and peaches/nectarines are available on request.

MEASURING FRUIT SIZE

All-purpose sizing ring



Measuring with the all-purpose loops

All-purpose metal loop with flexible adjustment: for continuously variable measurement of fruit size from 32 mm to 95 mm circumference. With diameter display and pouch included.
All-purpose plastic loop (sizing ring) with flexible adjustment: for continuously variable measurement of fruit size from 20 mm to 100 mm circumference.

ARTICLE NO.	
30004630	All-purpose sizing ring 32 mm to 95 mm, metal, with case
30004631	All-purpose sizing ring 20 mm to 100 mm, plastic



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CHAPTER

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BIOGAS ANALYSIS

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Analysis of gas from biological processes: such as biogas, sewage gas and landfill gas

SSM 6000, SSM 6000 Classic, SSM 6000 ECO, SSM 6000 Lab

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ANALYSIS OF GASES FROM BIOLOGICAL PROCESSES

SSM 6000



SSM6000 ECO



SSM 6000, tabletop unit



SSM 6000 Classic



SSM 6000, 19" version



Condensate pre-separator, accessories

Using the SSM 6000

The SSM 6000 was specially designed to analyse gas from biological processes such as biogas, sewage gas or landfill gas. It is designed for the requirements of regular process monitoring directly at facilities. It combines high quality sensor technology for continuous gas analysis with multi-stage gas processing technology. When fully configured, the main types of gas that can be detected are: methane, hydrogen sulphide, oxygen, carbon dioxide and hydrogen. The analysis is fully automatic and can be carried out at variable time intervals (e.g. every eight hours). Optionally, it is also possible to continually measure specific gases. The SSM 6000 has a clear display and is easy to use. It features a data logger with a history function that records the specific time for all measured values.

proCAL and automatic calibration

The proCAL process (developed by PRONOVA) enables improved long-term stability for the methane and carbon dioxide measurements. With the additional automatic one-point calibration of all other measurement channels, the SSM 6000 sets new standards for long-term stability.

SSM 6000 Classic

Multi-channel meter with integrated gas conditioning for the analysis of methane, oxygen, carbon dioxide and hydrogen, as well as for high concentrations of hydrogen sulphide. The device is suitable for discontinuous and continuous operation, designed for up to four internal measuring points.

SSM 6000 LT

The SSM 6000 LT is available for simple and cost-effective routine monitoring tasks. It is a variant of the SSM 6000 Classic, but the standard version does not have a gas cooler. It also has a load limitation for the hydrogen sulphide measurements. The standard range of measurement is 0 – 1000 ppm for hydrogen sulphide.

TECHNICAL SPECIFICATIONS:

Measurement range:

CH ₄ :	0 to 100 vol.%
CO ₂ :	0 to 100 vol.%
O ₂ :	0 to 25 vol.%
H ₂ S:	0 to 5,000 ppm SSM 6000 Classic
H ₂ S:	0 to 1,000 ppm SSM 6000 Classic
H ₂ :	0 to 1,000 ppm
Others available on request	

Resolution:

CH ₄ :	0.1 vol.%
CO ₂ :	0.1 vol.%
O ₂ :	0.1 vol.%
H ₂ S:	1 ppm
H ₂ :	1 ppm

Display:

LED measured value display and LCD

Communication:

RS232, optional Profibus DP

Operating temperature:

+5 to 40 °C

Power supply:

85 to 264 VAC, 47 to 63 Hz

Degree of protection:

IP 20

Dimensions and weight:

300 x 400 x 200 mm,
approx. 13 kg (Classic 4 K)

ARTICLE NO.

10001102	SSM 6000 Classic (CH ₄ , H ₂ S)
10001103	SSM 6000 Classic (CH ₄ , H ₂ S, O ₂)
10001104	SSM 6000 Classic (CH ₄ , H ₂ S, O ₂ , CO ₂)
10001106	SSM 6000 LT (CH ₄ , H ₂ S)
10001107	SSM 6000 LT (CH ₄ , H ₂ S, O ₂)
10001108	SSM 6000 LT (CH ₄ , H ₂ S, O ₂ , CO ₂)
10001126	SSM 6000 ECO (H ₂ S)
10001131	SSM 6000 ECO (CH ₄)
10001006	Condensate pre-separator

OPTIONS

SSM 6000 LT and Classic

10001110a	H ₂ (measuring range: 1,000 ppm)
10001117	Additional measuring points (up to 4)
10001118	Cooler for sample gas
10001120	Profibus DP interface
10001122	cont. measurement (except H ₂ S)
10001127	19" tabletop device
10001129	19" component rack
10001130	Lab version
Others available on request	



SSM6000 ECO

Single-channel measuring device for the monitoring (continual control) of hydrogen sulphide at desulphurization facilities or of the methane content at combined thermal power plants.

SSM 6000 Lab

Special version of the SSM 6000 specifically designed for laboratory applications. The SSM 6000 Lab is specifically for measuring small sample volumes.

SOIL MEASUREMENTS

Oxygen/temperature lance



Oxygen and temperature analysis for composting

In industrial composting plants, oxygen concentrations and temperature must be monitored in order to optimize the decay process. The oxygen lance, equipped with an amperometric Clark O₂ sensor, can reliably measure oxygen concentrations in compost. When connected into a control/ventilation system, the lance can be used to control the ventilation of the decaying materials during the intensive rot stage. This ensures that sufficient oxygen is available for the quick and complete aerobic conversion of the material. The ventilator uses very little power and water loss in the rotting material is minimal. As a result, it is possible to skip the time-consuming and costly step of turning over the rotting material. This reduces the amount of disturbing odours.

Measurements can be taken directly on site when used in conjunction with the AM 40 handheld meter (refer to page 33). Various control solutions can be put together using the MV 5030 stationary unit (compare with page 32).

TECHNICAL SPECIFICATIONS:

	O ₂ sensor
Measurement range:	O ₂ : 0 to 25 vol. % Temperature: 5 to +80 °C
Operating temperature:	5 to +80 °C
Air humidity:	max. 100% relative humidity – but with no condensation on the sensor membrane
Dimensions:	Shaft length: approx. 100 mm; Shaft diameter: ø 18 mm
Material:	FEP, 1.4571 stainless steel, POM
	Oxygen/temperature insertion probe
Material:	Stainless steel WS 1.4571 (DIN 17440), certified crystal alloy for special requirements
Operating temperature:	0 to +80 °C
Dimensions:	ø 22 mm (shaft), approx. 28 mm (tip), total length approx. 1,100 mm
Weight:	Approx. 2.5 kg

ARTICLE NO.

30004520 Oxygen/temperature lance for measurements in soil

Lance, hand-held AM 40 instrument, accessories

AMBIENT AIR MEASUREMENTS

Carbon dioxide/climatic measuring device with Bluetooth



Mobile carbon dioxide/humidity and temperature measurements

Compact hand-held meter with intuitive menus for measuring carbon dioxide and climatic conditions, optionally with extra climatic probes. Logs can be exported as Excel files via the USB interface or printed out on site. There is a Bluetooth connection to the climatic sensor. The device comes with a case.

TECHNICAL SPECIFICATIONS:

	Climatic probe
Measurement range:	CO ₂ : 0 to 10,000 ppm Air humidity: 5 to 95 % rel. humidity Temperature: 0 to +50 °C
Accuracy:	CO ₂ : ± 50 ppm + 3 % meas. value (0 to 5,000 ppm) ± 10 ppm + 5 % meas. value (5,001 to 10,000 ppm) Humidity: ± 3 % (10 to 35 % rel. humidity) ± 3 % (35 to 65 % rel. humidity) ± 2 % (65 to 90 % rel. humidity) ± 5 % (remaining measuring range) Temperature: ± 0.5 °C
Resolution:	CO ₂ : 1 ppm Air humidity: 0.1 % relative humidity Temperature: 0.1 °C
	Air conditioner
Display:	Liquid crystal display
Operating temperature:	–20 to +50 °C
Power supply:	Three 1.5 volt batteries (LR44)
Run time:	approx. 12 hours
Dimensions and weight:	154 x 65 x 32 mm, 250 g
Special features:	Bluetooth



ARTICLE NO.

30004390 Carbon dioxide / climatic measuring device with Bluetooth (air conditioner, climatic probe for CO₂ / rF/T and case)

Other climatic probes available on request

Carbon dioxide/humidity meter



Mobile carbon dioxide/humidity measurements

Mobile measuring device for carbon dioxide and humidity in the ambient air. NDIR sensor for measuring carbon dioxide. External sensor for air humidity and carbon dioxide. Minimum/maximum functions.

The meter can also calculate the dew point. Perfect for use in greenhouses. Can switch between Celsius and Fahrenheit degrees. The device comes with a case.

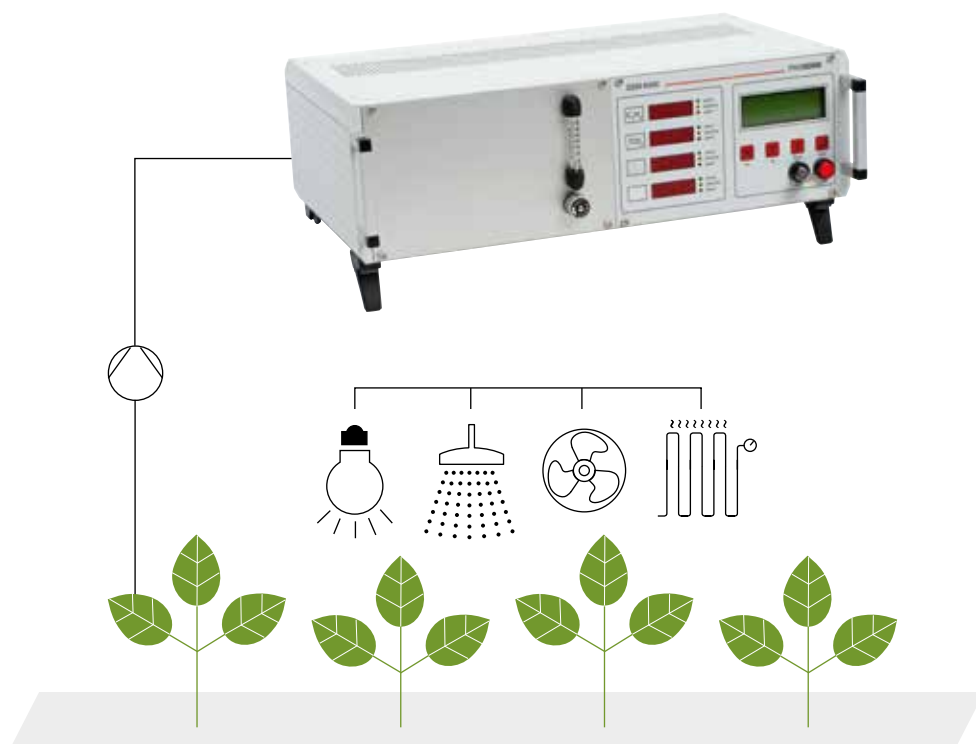
TECHNICAL SPECIFICATIONS:

Measurement range:	CO ₂ : 0 to 4,000 ppm Air humidity: 10 to 95 % rel. humidity Temperature: 0 to +50 °C Dew point: –25.3 to +48.9 °C
Resolution:	CO ₂ : 1 ppm Air humidity: 0.1 % relative humidity Temperature: 0.1 °C Dew point: 0.1 °C
Accuracy:	CO ₂ : ± 40 ppm (< 1,000 ppm) ± 5 % meas. value (> 1,000 to < 3,000 ppm) ± 250 ppm (> 3,000 ppm) Air humidity: ± 3 % meas. value (< 70 % rel. humidity) ± 3 % meas. value + 1 % (> 70 % rel. humidity) Temperature: 0.8 °C
Display:	two-character LCD display
Operating temperature:	0 to +50 °C
Power supply:	One nine-volt battery, size 6LR61



30004355 Carbon dioxide / humidity meter

Phyto monitoring



Gefördert durch:
 Bundesministerium
 für Wirtschaft
 und Technologie
 aufgrund eines Beschlusses
 des Deutschen Bundestages



Measurements of ethylene and carbon dioxide in plants and crops

The SSM 6000 Phyto stationary analysis system is used for continual measurements of ethylene and carbon dioxide in plants and crops.

Using gas exchange measurements on plant parts (such as on leaves or fruits), it is possible to determine information on plant growth and biological activity. Conditions for plant growth can be optimized and resource usage can be minimized by measuring the concentrations of ethylene and carbon dioxide.

The limit values for plant stress conditions can be determined using these measured variables. This information can then be used in conjunction with an automation system to provide process control within the greenhouse.

TECHNICAL SPECIFICATIONS:

Measurement range:

C_2H_4	10 ppm
CO_2	2,000 ppm

Measurement technique:

C_2H_4	Electrochemical sensor
CO_2	NDIR measurement

Resolution:

C_2H_4	1 ppb
CO_2	0.1 ppm

Repeat accuracy:

C_2H_4	2% of measured value
CO_2	2% of measured value

Detection limit (2 σ):

C_2H_4	2 ppb
CO_2	2 ppm

Long-term stability:

C_2H_4	high long-term stability
CO_2	high long-term stability with proCAL

Display: 4-character LED display, status screens,
4-character LCD display

Communication: RS 232, 4 – 20 mA

Operating temperature: +5 to +40 °C

Power supply: AC 85-264 VAC, 47-63 Hz

Degree of protection: IP 40

Dimensions and weight: 450 x 135 x 300 mm,
approx. 10 kg

Options: Profibus DP, several measuring points, etc.

Special features: Data storage

ARTICLE
NO.

SSM 6000 Phyto



Photography: © Tassilo Gast





MV 4000 transmitter series



Measuring amplifier

These transmitters are suitable for inexpensive measurements of one or more process variables. They are very versatile and easy to use. Calibrations are easy to carry out directly at the transmitter.

The MV 4000 has an additional display which facilitates the control of measured values, calibrations, and enables each transmitter to be used as an independent measuring instrument

TECHNICAL SPECIFICATIONS:

Parameters:	1 x pH, redox, conductivity, O ₂ , ISE (NH ₄ , NO ₃ , K, Cl, F, etc.)
Display:	LCD
Analogue outputs:	2 x 0(4) to 20 mA, or 0 to 5 VDC
Control outputs:	1 x normally open contact: max. 125 VAC, 60 VDC, 30 VA
Interface:	USB
Power supply:	15 to 24 VAC/DC, approx. 1.5 VA
Housing:	Plastic for top-hat rail mounting DIN EN 50022-35
Degree of protection:	IP 40 (EN 60529)
Dimensions:	45 x 99 x 114.5 mm

ARTICLE NO.	
45MV4010	pH transmitter 0 – 14 pH
45MV4020	Conductivity transmitter 0 – 20 mS/cm
45MV4016	ISE transmitter e.g. NH ₄ , NO ₃ etc.
45MV4015	Redox transmitter ± 2,000 mV
45MV4030	O ₂ transmitter 0 – 20 mg/l
Others available on request	

KM 3000



Multi-parameter measuring system KM 3000

The KM 3000 multi-parameter controller has a modular bus structure; it provides excellent functionality, maximum operational reliability, outstanding ease, and a wide range of customized configuration options. The KM 3000 offers a complete system solution for any application where multiple parameters need to be detected on-line, and where these measurements need to be transmitted and evaluated very reliably. It also is capable of documenting and controlling processes.



TECHNICAL SPECIFICATIONS:

Parameters:	max. 16 for pH, redox, conductivity, O ₂ , CO ₂ , ISE (NH ₄ , NO ₃ , Cl, F, K etc.)
Display:	5.7" touch screen
Data logger:	approx. 100,000 parameter sets
Analogue outputs:	4 x 0(4) to 20 mA
Relay outputs:	4 x potential-free outputs, max. 3 A, 250 VAC
Interface:	USB, RS285, RS485
Power supply:	115/230 VAC, 48 to 63 Hz or 15 to 30 VAC/DC
Housing:	Wall mount, in aluminium
Degree of protection:	IP 65 (EN 60529)
Dimensions:	240 x 240 x 120 mm

ARTICLE NO.	
45KM3000	Multi-parameter controller, base unit
45MVM2210	pH measuring module 0 to 14 pH, without electrode
45MVM2216	ISE measuring module e.g. NH ₄ , NO ₃ etc., without electrode
45MVM2220	Conductivity transmitter 0 – 20 mS/cm, without electrode
45GSM3000	GSM/GPRS modem
Others available on request	

MV 50xx series



Single-channel measuring transducer MV 50xx

The MV 50xx series of measuring transducers is perfect for taking stationary measurements directly at the measuring point in the open field. The measuring transducer is simple and intuitive to use. It also maintains the essential functionality with maximum operational reliability and safety. Each MV 50xx features a large OLED display and plain-text menu navigation. The software also enables you to configure, calibrate, view and record measured values at your PC using a standard USB port.

Areas of use:

- Water hardness
- Water quality measuring systems
- Process monitoring
- Process control

Special features:

- Cost-effective measurement of process variables
- Easy to use (plain text menus)
- Simultaneous temperature measurement and temperature compensation
- 2 scalable analogue outputs and 2 relay outputs
- USB interface and PC software
- Firmware updates via USB
- IP 65 field housing

TECHNICAL SPECIFICATIONS:

Parameters:	1 for pH, redox, conductivity, O ₂ , CO ₂ , ISE (NH ₄ , NO ₃ , K, Cl, F etc.)
Display:	graphic OLED, 128 x 64 pixels with plain text menu
Data logger:	4,000 parameter sets
Analogue outputs:	Two 0(4) to 20 mA, or two 0 to 5 V
Control outputs:	2 limit switch contacts, CO contact, max. 250 V AC / 5 A; PID controller, bi-directional (pulse length or analogue controller)
Interface:	USB (optional RS-232)
Power supply:	100 to 240 VAC, 18 to 36 VDC
Housing:	Aluminium housing for wall mount
Protection degree:	IP 65
Dimensions:	W 160 x H 130 x D 70 mm

ARTICLE NO.	
45MV5010	pH measuring transducer 0 – 14 pH
45MV5020	LF measuring transducer 0 – 20 mS/cm
45MV5016	ISE measuring transducer e.g. NH ₄ , NO ₃ etc.
45MV5030	O ₂ measuring transducer 0 – 20 mg/l



Ion-selective electrodes



TECHNICAL SPECIFICATIONS:

Measurement range:	NH ₄ ⁺ : 0.2 to 18,000 mg/l
	Br ⁻ : 0.5 to 79,000 mg/l
	Ca ²⁺ : 0.1 to 40,000 mg/l
	Cl ⁻ : 1 to 35,000 mg/l
	CN ⁻ : 0.03 to 2,600 mg/l
	F ⁻ : 0.02 to 20,000 mg/l
	K ⁺ : 0.4 to 39,100 mg/l
	J ⁻ : 0.1 to 10,000 mg/l
	Cu ²⁺ : 0.1 to 6,000 mg/l
	Na ⁺ : 5 to 20,000 mg/l
	NO ₃ ⁻ : 0.4 to 60,000 mg/l
	NO ₂ ⁻ : 5 to 5,000 mg/l
	Ag ⁺ : 0.1 to 10,000 mg/l
	S ²⁻ : 0.03 to 3,200 mg/l
Shaft material:	Plastic (black)
Dimensions (length x diameter):	145 x 12 mm
Immersion depth:	120 mm
Other dimensions and plugs available by customer request	

Ion-selective electrodes (ISE) are used to determine ion activities or ion concentrations directly in liquids, independent of colour and opacity. The measurement itself is performed by immersing an ion-selective electrode and a reference electrode in the actual sample solution and the measuring the cell voltage.

Silver/silver chloride and saturated calomel electrodes should be used as the reference electrodes. For all measuring tasks, a DC voltmeter with an input resistance greater than 10¹⁰ ohm can be used. High-resolution pH measuring amplifiers with mV functionality or the ISE 40 ion meter fulfil this requirement perfectly.

ARTICLE NO.	
Combination electrodes	
40183xxx	Ammonium NH ₄ ⁺
40184xxx	Bromide, Br ⁻
40188xxx	Calcium, Ca ²⁺
40182xxx	Chloride, Cl ⁻
40190xxx	Fluoride, F ⁻
40194xxx	Iodide-/Cyanide, J ⁻ /CN ⁻
40185xxx	Potassium K ⁺
40189xxx	Copper Cu ²⁺
40192xxx	Sodium, Na ⁺
40180xxx	Nitrate, NO ₃ ⁻
40181xxx	Nitrite, NO ₂ ⁻
40187xxx	Silver/Sulphide, Ag ⁺ /S ²⁻

The ion-selective electrodes are preferably used for determining the concentration of anions or cations in aqueous or chemical-organic/aqueous solutions. Depending on the type of ion/electrode, specific pH ranges must be set. (Refer to the electrode data sheets for more information at www.irasgmbh.com)

ARTICLE NO.	
Individual electrodes	
40118xxx	Ammonium selective electrode, NH ₄ ⁺
40100xxx	Bromide selective electrode, Br ⁻
40102xxx	Calcium selective electrode, Ca ²⁺
40104xxx	Chloride selective electrode, Cl ⁻
40110xxx	Fluoride selective electrode, F ⁻
40106xxx	Iodide/cyanide selective electrodes, J ⁻ /CN ⁻
40134xxx	Potassium selective electrode, K ⁺
40112xxx	Copper selective electrode, Cu ²⁺
40136xxx	Sodium selective electrode, Na ⁺
40114xxx	Nitrate selective electrode, NO ₃ ⁻
40138xxx	Nitrite selective electrode, NO ₂ ⁻
40116xxx	Silver/sulphide selective electrode, Ag ⁺ /S ²⁻
ACCESSORIES	
40xxx100	1-meter attached cable, open end
40xxx101	1-meter attached cable, with BNC plug
40xxx103T	1-meter fixed cable and special plug for ISE 40 with integrated temperature sensor
40xxx005	PG 13.5" industrial plug-in head
40xxx006	S7 laboratory plug-in head

PORTABLE DEVICES

CHAPTER 11

TM 40, ISE 40 CO₂, LF 40, AM 40, ISE 40



Measures pH, redox, ion concentrations, conductivity and dissolved gases

These measuring devices offer the advantages of a mobile field unit together with the precision and comfort of a laboratory instrument: with high measurement accuracy, a multifunction graphic display, integrated data logger and heavy-duty IP 65 housing.

The important GLP functions – such as date/time, primary measured value, secondary measured value (including the physical units), temperature and device number – are transmitted and recorded in the data file.

The TM 40 features automatic temperature compensation for pH measurements and manual temperature input when measuring without a temperature sensor. Either manual or automatic two-point calibration is available for the calibration.

TECHNICAL SPECIFICATIONS:

Measurement range:	
TM 40	pH: 0 to 14; -1,999 to 1,999 mV;
ISE 40 CO ₂	0.1 to 3,000 mg/l;
ISE 40	0.1 mg/l to 100 g/l;
LF 40	LF: 0 to 200 µS/cm; 0 to 2,000 µS/cm;
	0 to 20 mS/cm; 0 to 500 mS/cm;
	automatic measuring range switch-over;
	TDS: 0 to 200 mg/l; 0 to 2,000 mg/l;
	0 to 20 g/l; 0 to 500 g/l;
	Salinity: 0 to 70 g/kg;
AM 40	O ₂ : 0 to 200 %; 0 to 20 mg/l
Resolution:	
TM 40	0.01 pH; 1 mV
ISE 40 / TM 40 CO ₂	0.1 mg/l
LF 40	0.1 µS; 1 µS; 0.01 mS; 0.1 mS
AM 40	1 %; 0.01 mg/l,
	Temperature: 0.1 °C
Accuracy:	
TM 40	± 0.02 pH; ± 1 mV
LF 40	± 1 % to 200 mS
AM 40	± 1 %; ± 0.01 mg/l
Display:	graphic LCD, 128 x 64 pixels, back-lit
Communication:	USB, electrical/galvanic isolation
Data logger:	4,000 data records
Power supply:	three AA batteries, IEC R6, LR6, 1.5 V
Degree of protection:	IP 65
Dimensions and weight:	200 x 95 x 40 mm,
	approx. 290 g

The measuring device can also be used to measure the redox potential or ISE potential relative to the standard hydrogen electrode, in accordance with DIN 38404.

ARTICLE NO.	
45TM40	TM 40 set, for pH
45ISE40	ISE 40 base unit
45ISE40 CO ₂	ISE 40 CO ₂ set
45LF40	LF 40 set, for conductivity
45AM40	AM 40 set, für O ₂
Each measuring device is delivered in a set with probe/electrode, solutions and spare parts (AM 40) in a case.	

The ISE 40 takes temperature-compensated measurements of ion concentrations across a wide range of concentrations.

The ISE 40 CO₂ enables dissolved carbon dioxide to be measured in an aqueous solution.

The LF 40 is perfectly suited for checking electrical conductivity, salinity and temperature in surface waters, waste water and during waste water treatment.

The AM 40 is ideal for checking oxygen content in surface waters, waste water and during waste water treatment. The measuring device, in communication with the sensor, simultaneously detects the mass concentration of the dissolved oxygen in mg/l, the oxygen saturation index (% saturation) and the temperature.



HUMIDITY ANALYSIS

Measurements in soil



12

BWK 2000 for determining the water balance

35

Bambach tensio technology: Plug-in tensiometers, Surface tensiometers, Small tensiometers, Manometers for tensiometers, Switching sensors, Electronic tensiometers, Electronic soil moisture sensors, Remote monitoring with radio control (FFF)

36 – 40

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HYDRO 2000, Soil moisture sensor SM150, Soil moisture meter VG 200

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SensorMatic15, Data logger for tensiometers, TensioController

40/42/43

Irrigation controller



TEMPERATURE MEASURING SYSTEMS

Minimum/maximum thermometers

13

Minimum/maximum thermometers, Digital minimum/maximum thermometers

46

Analogue thermometers

Gardener thermometers, Plastic thermometers, Insertion thermometers
Compost and bi-metal thermometers, Temperature measuring lance

46/49

Digital thermometers

Temperature measuring probes, Thermometers with external sensors,
Miniflash, Laser thermometers

48

Data loggers

Compact data logger, T2 data loggers, USB data loggers, Digital thermometers

47/48



SOIL MEASUREMENTS

BWK 2000



BWK 2000 for determining the water balance

The BWK 2000 is a measuring instrument for determining the volumetric water content of mineral soils at different depths.

Thanks to the robust stainless steel lance and the aluminium housing which protects against moisture and dust, the BWK 2000 can be used in rough conditions. The sensor at the tip of the lance works according to the FDR (Frequency Domain Reflectometry) principle; it determines the volumetric water content by using a high measuring frequency, with only a slight influence from the salinity of the soil. Furthermore, by selecting different calibrations, precise measurements can be made even when the soil types change. In addition to the volumetric water content, the salt content / conductivity of the soil and the temperature in the soil are also measured with each measurement. These values are stored in the integrated data logger.

The measured values recorded in this way can be transferred directly to the PC using a USB cable. The measurements of salinity, conductivity and temperature take place directly at the tip of the sensor. This enables the precise determination of these parameters at different soil depths.

The ability of soils to absorb moisture and then make it available to plants varies greatly depending on the different soil types. In general, sandy and humus-

filled soils can provide significantly more plant-available water during wetter conditions, while loamy soils or clay soils have greater water-holding capacity during dry periods. By combining the knowledge of the soil texture together with the measurement of the volumetric water content in the soil using the BWK 2000, the supply of plants with moisture can be optimally monitored and adjusted.

ARTICLE
NO.

30009050 BWK 2000

TECHNICAL SPECIFICATIONS:

Measurement range:

volumetric water content (VWC): 0 to 50 vol.%,

Salinity/conductivity: 0 to 3 g/l / 0 to 5 mS/cm

Temperature: 0 to 50 °C

Accuracy:

volumetric water content (VWC): $\pm 3\%$ vol.%,Salinity/conductivity: ± 0.02 g/l or mS/cmTemperature: $\pm 0.2^\circ\text{C}$

Resolution:

volumetric water content (VWC): 0.1 vol.%,

Salt content/conductivity: 0.01 g/l / 0.01 mS/cm

Temperature: 0.1 °C

Display:

Liquid crystal display

Memory size:

for approx. 1,000 measurements

Languages:

German, English

Operating temperature:

-10 to +55 °C

Power supply: 3.7 V LiPo battery, or one nine-volt block
battery 6LR61 size

Max. insertion depth:

90 cm

Degree of protection:

IP 65

Dimensions and weight:

approx. 420 x 1050 x 90 mm

Lance: \varnothing 20 mm, 1.4 kg

Application areas:

The BWK 2000 is well suited for measuring at depths of up to 90 cm. It is preferably used in tree nurseries, vineyards, vegetable growing, for special crops such as berries and asparagus, in arable farming, and in urban green zones.

The measuring depth can be determined by referencing the markings on the stainless steel lance. You must work at the same depth if you want to compare the measured soil moisture values with each other. In order to meaningfully determine the volumetric water content, we recommend carrying out several measurements and then averaging the measured values obtained (similar as with soil samples).

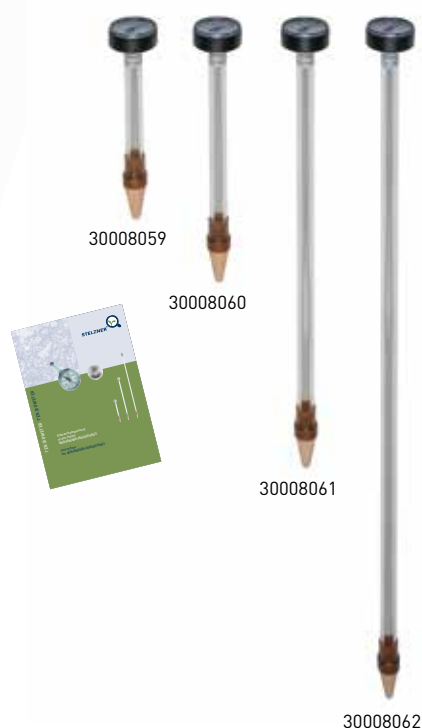
SOIL MEASUREMENTS

Plug-in tensiometer

The **Classic plug-in tensiometer** has a measuring range of 0 to 600 mbar negative pressure. It also features an analogue manometer for displaying the measured value.



Classic plug-in tensiometer, in 4 lengths



ARTICLE NO.
Classic plug-in tensiometer
Delivered with manometer
30008059 Length: 20 cm*
30008060 Length: 30 cm*
30008061 Length: 60 cm*
30008062 Length: 100 cm*
* Approx. insertion depth
ACCESSORIES
30008066 10 flat seals
30008001 Classic manometer plug-in tensiometer

TECHNICAL SPECIFICATIONS:

Tube diameter:	Classic: ø 18 mm
	Blumat: ø 25 mm
Porous cell:	20 x 55 mm, conical
	Blumat: 20 x 65 mm, cylindrical
Manometer:	-600 mbar
Material:	plastic



For analogue measurements of the suction tension

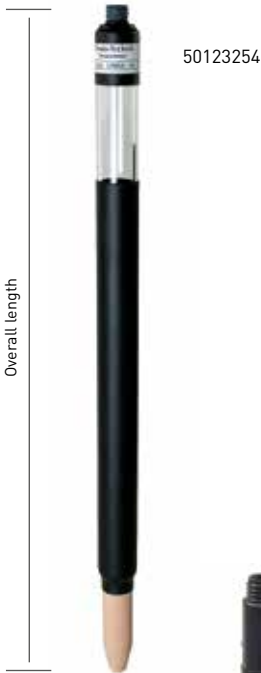
A tensiometer is used to measure suction tension. The porous cell of the tensiometer uses capillary action to transport water outwards into the drier soil. A negative pressure is then created within the closed pipe. This negative pressure is an indication of the moisture. Suction tension is a force measuring the tension with which the water is held to the soil or its availability.

Plant roots must expend this force in order to absorb water. The decisive factors in creating this force are the fine pores and capillaries in the soil. This soil characteristic which the tensiometer measures is critical for plant growth. One advantage this instrument has over electrical meters is that it does not need to be calibrated.

The value of the suction tension increases as long as the substratum is capable of transferring the water and as long as the moisture differential is maintained. If the surroundings become more moist, the process reverses itself. Close contact with the substrate is needed to get a quick tensiometer reaction and to get a value for certain soil and substratum types.

SOIL MEASUREMENTS

Premium
plug-in tensiometer



The special features of this design are the spacious, stable tube and the strong, long, cylindrical porous cell. In addition to its mechanical stability, a key advantage is the extended service life that results from the greater filling volume. The shrunk protective tube with viewing window increases the tightness of the seal. Tensiometers usually protrude 8 to 10 cm from the ground to avoid the temperature influence of tubes protruding too far out of the ground. The total length should therefore be determined by the desired measuring depth. It is also possible to connect different thread types to implement irrigation controls with switching sensors etc.

TECHNICAL SPECIFICATIONS:

Tube diameter:	ø 25 mm
Porous cell:	20 x 65 mm, cylindrical
Threaded connection:	GL14 for analogue manometer+ sensors BL for digital manometer IT for GL14 and BL, 45°



ARTICLE NO.
Plug-in tensiometer Premium
Order the manometer separately
50123024 Type LM-BL, length 24 cm*
50123034 Type LM-BL, length 34 cm*
50123044 Type LM-BL, length 44 cm*
50123054 Type LM-BL, length 54 cm*
50123064 Type LM-BL, length 64 cm*
50123074 Type LM-BL, length 74 cm*
50123224 Type LM-GL, length 24 cm*
50123234 Type LM-GL, length 34 cm*
50123244 Type LM-GL, length 44 cm*
50123254 Type LM-GL, length 54 cm*
50123264 Type LM-GL, length 64 cm*
50123274 Type LM-GL, length 74 cm*
50123424 Type LM-IT, length 24 cm*
50123434 Type LM-IT, length 34 cm*
50123444 Type LM-IT, length 44 cm*
* Overall length



Usage	Overall length	Insertion depth
Vegetable crops, soft fruits, small woody plants, Root zone	24 cm, 34 cm	approx. 15 cm, 25 cm
Woody plants, trees, Root zone	44 cm, 54 cm	approx. 35 cm, 45 cm
Depth measurements for trees, Monitoring seap (leakage) water	64 cm, 74 cm	approx. 55 cm, 65 cm



SOIL MEASUREMENTS

Surface tensiometer



Surface tensiometers can be used for measuring the moisture on irrigation fleeces, on substrate surfaces, within the substrate, as well as on other technical fleeces.



Together with a switch sensor or E-sensor, they are used for irrigation control in mat irrigation systems – with either drip or flood systems – or in thin-layer crops with drip systems. More frequent refilling is required at suction pressures above approx. 300 hPa. Height approx. 65 mm, Diameter of clay foot approx. 70 mm, Configuration also with T-piece 45° with two GL14s.

TECHNICAL SPECIFICATIONS:

Clay foot:	approx. diameter of 70 mm
Threaded connection:	BL: for digital manometer, GL14: for analogue manometer+sensors, IT45: for two GL14s, 45°

ARTICLE NO.

Surface tensiometer

Order the manometer separately

501100	Type FO-GL, open-pore
501100 IT45	Type FO-IT45, open-pore
501110	Type FV-GL
501110 IT45	Type FV-IT45

HUMIDITY ANALYSIS

CHAPTER 13

SOIL MEASUREMENTS

Small tensiometer



Small plug-in tensiometers can have two different porous cell sizes: 10 mm diameter for the smallest vessels (pots from approx. 8 cm), also in dam or gutter crops, and 15 mm diameter for common pot sizes and also well suited for loose or granulated substrates. Used mainly in humidity range up to max. 200 – 300 hPa.

The tensiometers are inserted to depths of 40 – 70 mm or 50 – 90 mm. Connections for analogue manometers, switch sensors and E-sensors, also with built-in T-piece. The Premium plug-in tensiometers (see page 37) are also available in small sizes with a length of 16 or 19 cm, a porous cell of 20 mm, and a tube diameter of 25 mm. Their larger filling volume is an advantage. The large porous cell must, however, fit.

TECHNICAL SPECIFICATIONS:

Tube diameter:	KV02: ø 15 mm KV2: ø 20 mm LM: ø 25 mm
Porous cell:	KV02: 10 x 30 mm, cylindrical KV2: 15 x 40 mm, cylindrical LM: 20 x 60 mm, cylindrical
Threaded connection:	BL: for digital manometer, GL14: for analogue manometer+sensors, IT45: for two GL14s, 45°

ARTICLE NO.

Small tensiometer

501202	Type KV02-GL, length 12 cm*
501206	Type KV2-GL, length 15 cm*
501206 IT45	Type KV2-IT45, length 15 cm*
50123216	Type LM-GL, length 16 cm*
50123219	Type LM-GL, length 19 cm*

* Overall length

HUMIDITY ANALYSIS

CHAPTER 13

SOIL MEASUREMENTS

Manometer for tensiometer



Analogue manometer

As a pressure measuring instrument, the manometer displays the suction tension of a tensiometer directly and without any preparation. These instruments are maintenance-free and very durable. However, they are classified as a sensitive measuring device and thus must be handled with appropriate care. The manometers are adjusted individually and the zero point can be set. Together with M-sensors, they are used for control measurements or to assess the set switching point.

Digital manometer

The digital manometer consists of a piezo-resistive pressure sensor and the display electronics with battery-supplied power. It must be switched on by pressing a button. In all other respects, the usage corresponds to that of the analogue manometer. Combined usage with an M-sensor is also possible by means of a T-piece.

TECHNICAL SPECIFICATIONS:

Analogue manometer	
Design:	Capsule spring
Housing:	Stainless steel
Overload protection:	1000 hPa
Accuracy class:	1.6
Diameter:	ø 50 mm
Connection thread:	Screw cap GL14
Digital manometer	
Measurement range:	15 – 800 mbar
Accuracy:	± 2 mbar
Display duration:	10 seconds
Battery:	CR2032
Diameter:	ø 45 mm
Connection thread:	BL

ARTICLE NO.

501705	Manometer M 400 Measuring range 0 to -400 mbar
501707	Manometer M 600 Measuring range 0 to -600 mbar

501721 Digital manometer Type BD

ACCESSORIES

501312	Adapter GL14 > IT45
501313	Thread adapter GL14 > BL
501725	Protective cap for digital manometer

SOIL MEASUREMENTS

Switching sensors



M-sensors are pressure manostat monitors that provide the tensiometer with switching properties. These pressure manostat monitors are membrane switches for applications in the low voltage range (e.g. 24 VDC) where a defined, limited switching range can be implemented. They allow infinitely variable adjustment of the switching point, but with no scaling.

For irrigating automatically, the M sensors can either switch the solenoid valve directly or they can be connected to an automatic irrigation system.

The **TensioSwitch** has the same function as an M-sensor, but has contactless switching, an LED switching display, and requires a power supply. It is well suited for direct switching or use with a relay.

TECHNICAL SPECIFICATIONS:

M-sensors	
Max. voltage:	24 V
Switching differential:	approx. 20 % of the final value
Tensiometer connection:	Screw cap GL14
Electrical connections:	Flat plug 6.3 mm
TensioSwitch	
Switching range:	25 – 400 hPa
Switching differential:	approx. 10 hPa
Power supply:	10 – 30 VDC
Electrical connections:	Plug socket M12x1
Tensiometer connection:	Screw cap GL14

ARTICLE NO.

50151010 M-sensors M-S10
(15 – 50 hPa)

50151050 M-sensors M-S50
(45 – 120 hPa)

501510 -100 M-sensors M-S100
(90 – 300 hPa)

501520 TensioSwitch TSW 400
(15 – 400 hPa)

ACCESSORIES

501522 Plug unit with connecting cable, 10 m

Relay unit for potential-free switching



HUMIDITY ANALYSIS

CHAPTER 13

SOIL MEASUREMENTS

Electronic tensiometers



E-sensors are electronic pressure sensors for tensiometers that record the continuous negative pressure and thus also the suction tension of the soil or substrate.

The sensors require a power supply and are designed with an analogue current output (4 – 20mA) or analogue voltage output (0.3 – 3.0 VDC), depending on the application.

The pressure sensor is housed in a ventilated plastic enclosure with encapsulated electronics. In the application, the E-sensors are connected to digital units such as data loggers, switching gear with analogue input, PLC (TensioController), and radio units.

The E-sensors always consist of the pressure sensor and the tensiometer lower part, depending on the desired size or insertion depth. The sensor alone only shows the measured value for the zero point without the suction voltage.

TECHNICAL SPECIFICATIONS:

Power supply:	ES-A: 17 to 24 V
	ES-V: 4 to 15 V
	ES-3V: 3.3 V
Accuracy:	± 1.5%
Connection:	5 metre attached cable
Cable:	ES-V: 3 x 0.14 mm ²
	ES-A: 2 x 0.14 mm ²
Connection Tensio:	Screw cap GL14
Dimensions:	26 x 70 mm
Weight without cable:	20 to 25 g

ARTICLE NO.

501604 E-sensors ES-A 500
-500 (20mA, 500 hPa)

501604 E-sensors ES-A 1000
-1000 (20mA, 1000 hPa)

501606 E-sensors ES-V 500
-500 (3.0 V, 500 hPa)

501606 E-sensors ES-V 1000
-1000 (3.0 V, 1000 hPa)

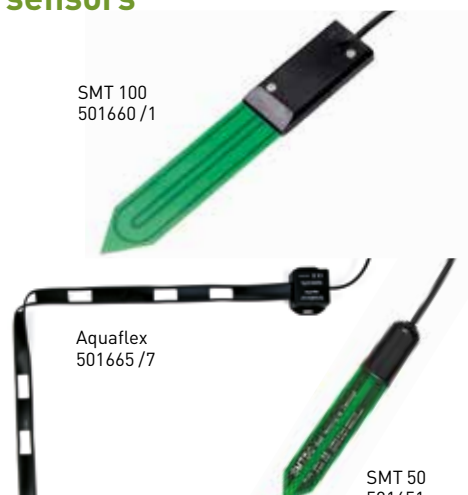
501608 E-sensors ES-3V 500
-500 (3.0 V, 500 hPa, const.)

501608 E-sensors ES-3V 1000
-1000 (3.0 V, 1000 hPa, const.)



SOIL MEASUREMENTS

Electronic soil moisture sensors



Volume sensors

Volume sensors measure the water content of the soil or substrate in volume fractions; this is displayed as a percentage based on m³ of water per m³ of soil or substrate. This is a measurement of soil moisture without any specification on the availability of water (the suction tension of the soil).

This is a direct capacitive measurement. The volume sensor forms a capacitor with the soil, the capacitance of which changes with the change in the dielectric property of the soil due to the changing humidity. It should be noted that the

TECHNICAL SPECIFICATIONS:

	SMT 50
Analogue signal:	0 – 3 V
Power supply:	3.3 – 30 V
Accuracy:	± 3 % not programmable, with temperature measurement
	SMT 100
Output signal:	0 to 10 V (analogue) or SDI12 (digital) Others on request
Accuracy:	± 3%, ± 1% (only with a soil-specific calibration)
Power supply:	4 – 24 V with temperature measurement
	Aquaflex
Output signal:	0 to 10 V (analogue) or SDI12 (digital) Others on request
Power supply:	4 – 24 V
Accuracy:	± 3 % with temperature measurement at the housing

dielectric property of the soil is also determined by its structure.

The volume sensors need clear contact. Thus, hollow cavities at the sensor must be avoided at all costs. Due to the high measuring frequency, the salinity of the soil has little influence on the measurement. For accurate measurements, the sensor should be calibrated according to the respective soil type.

Volume sensors are maintenance-free, very stable and suitable for installation underground.

ARTICLE NO.	
501651	Volume sensor SMT 50 Cable with open end
501660	Volume sensor SMT 100 analogue, cable with open end
501661	Volume sensor SMT 100 digital, cable with open end
501665	Aquaflex 100 Analog, 100 cm, cable with open end
501667	Aquaflex 300 Analogue, 300 cm, cable with open end

Volume sensor SMT 50

Measurement of soil moisture according to the FDR principle (Frequency Domain Reflectory) for simple measurements in the range of 0 to 50 vol. %. Measuring surface: approx. 9 x 2 cm

Volume sensor SMT 100

Measurement of soil moisture according to the TDT principle (Time Domain Transmissionmetry) for accurate measurements in the range of 0 to 100 vol. %. Measuring surface: approx. 11 x 3 cm; sensor has programmable settings.

Aquaflex

Measurement of soil moisture according to the TDT principle (Time Domain Transmissionmetry) for measurements in the range of 0 to 100 vol. %, as a mean value over the length. The measuring tape is approx. 2 cm wide and either 100 or 300 cm long. Well suited for row crops with drip irrigation or for lawn irrigation.

HUMIDITY ANALYSIS

CHAPTER 13

IRRIGATION CONTROL

SensorMatic15



Sensor-controlled switching unit for small irrigation systems

The single-channel Sensormatic 15 controller switches a solenoid valve for irrigation depending on the measured soil moisture.

This makes it easy to implement indoor greening systems, garden irrigation, as well as greenhouse or outdoor cultivation.

The soil moisture is measured with an SMT 50 volume sensor at regular intervals. Optionally, a second volume sensor can increase the reliability of the controller and the measuring point.

Depending on the power supply, either impulse valves (battery operated), standard solenoid valves or switching relays (with external mains power supplies) can be switched.



The functions are operated and set using buttons, rotary switches and DIP switches.

Several options are available for both the start and type of irrigation; the start set points can be specified and two sequence programs (for fixed time and cycle program) can be variably configured. The system can also be operated manually by pressing a button using an on/off switch.

ARTICLE NO.	
501558	SensorMatic 15
501651	Volume sensor SMT 50
Additional configurations and options available on request	

TECHNICAL SPECIFICATIONS:

Power supply:	Battery or mains power
Sensor input:	max. 2 Type SMT 50
Switching output:	1
Weight incl. batteries:	approx. 670 g
Dimensions:	Box with cable glands approx. 185 x 145 x 75 mm



SOIL MEASUREMENTS

Wireless unit for remote monitoring



FFF – Field Humidity Wireless

Using the FFF, measurement data – preferably moisture and temperature in the soil – that is recorded from remote and scattered areas can be transferred directly to your PC or smartphone for monitoring purposes.

This system enables the recording of real-time measurement data and monitoring with the help of a web-based dashboard. Thus, it is ideal for managing both urban facilities and farming operations. The wireless unit itself works with a very long-lasting battery and is waterproof. As such, it can be installed under the floor together with the sensors and is thus protected against vandalism. A special feature is the option to connect several different sensors to one wireless unit. Remote-controlled irrigation can be implemented using further components.

Usable sensors	Max. number per wireless unit
Volumetric humidity sensors with temperature measurement	
• Volume sensor SMT50 (refer to page 40)	4
• Volume sensor SMT100 (refer to page 40)	4
Electronic tensiometer (refer to page 39)	4
Conductivity sensor	4 – 8
Measuring head for flow meter (irrigation control)	1
Controllable units	
• Solenoid valve for irrigation control	1

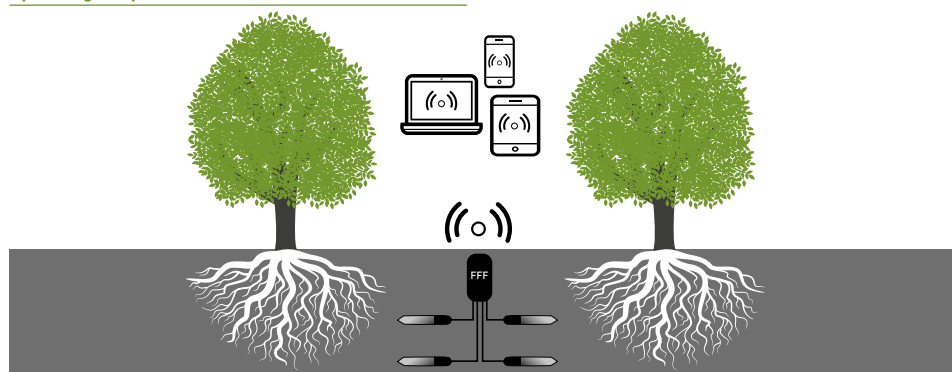
The system set up (installation) is simple. It only consists of connecting the sensors to the wireless unit and inserting the battery.

The dashboard of the Holfuy web service provides a clear user interface for easily viewing the sent measurement data. Measuring intervals can be easily changed, automatic notifications can be set and solenoid valves can be switched at the click of a mouse.

We would be happy to advise you on the best combination of wireless units and sensors for your projects and applications.

TECHNICAL DATA (wireless unit):

Power supply:	3.6 V lithium battery, type LS33600 with 17 Ah capacity
Power consumption:	<3.5 µA in sleep mode 80 mA LoRa, 500 mA NB-IoT during transmissions
Battery life:	at measuring interval of 4 hours > 5 years is possible
Measurement interval:	≥ 30 min to 4 hours, adjustable
Degree of protection:	IP68
Dimensions:	140 x 97 x 97 mm
Weight:	190 g without battery
Operating temperature:	-40 °C to +80 °C



Wireless radio technology	NB-IoT	LoRaWAN
Application range	No need to install your own network. Wireless unit transmits directly via the provider's NB-IoT network	Can be integrated into existing LoRa networks (SmartCity designs)
Wireless radio network availability	According to the provider (e.g. Vodafone)	Your own wireless radio network
Range	unlimited	up to 5 km

Connection options

	Measuring soil moisture and temperature	Measuring method
SMT50	low-cost sensor, maintenance-free, under-floor installation	FDR
SMT100	precision sensor, maintenance-free, under-floor installation	TDT
Electronic tensiometers	maintenance-free, above-floor (without temperature measurement)	Suction force
Flow measurement		
Measuring head for water meter	precise, maintenance-free	inductive
Controllable units		
Solenoid valve	Bistabil Pulse Solenoid Valve for connecting to irrigation systems	

ARTICLE NO.

FFF

50161003 FFF, 4 analogue sensors

50161004 FFF, 4 digital sensors

50161007 FFF, 1 solenoid valve

50161008 FFF, 1 flow counter

50161002 eSIM annual fee

5016100 Visualisation dashboard (annual fee)

Sensors

501651 SMT50

501660 Volume sensor SMT 100
analogue, cable with open end501661 Volume sensor SMT 100
digital, cable with open end501606/8 E-sensors
refer to page 39

502200 Solenoid valve

50168010 Conductivity module
10 mS/cm

Flow counter according to the application

IRRIGATION CONTROL

Data logger for tensiometers and volume sensors



ARTICLE NO.

501640 TensioLogger TRL

501641 TensioLogger with modem

501645 Connection box, digital

501646 Connection box, analog

Suitable sensors: Tensiometer with E-sensors, SMT 50/100, Aquaflex

TECHNICAL SPECIFICATIONS:

TensioLogger TRL	
Power supply:	5 – 12 VDC
Energy supply:	Battery pack in cover (4x1.5 V mono), optional external 5-VDC power supply or solar panel
Sensor interface:	RS485 (TBUS) up to 50 sensors per logger
Memory capacity:	32 MB for data
Transmission:	2G (4G) modem with SIM card, via FTP protocol
Connections:	1 socket for supply, 2 sockets for sensors, optionally 4 sockets
PC connection:	Adapter cable RS485-USB
Housing:	Plastic (PC), 100x200x70 mm, IP 66

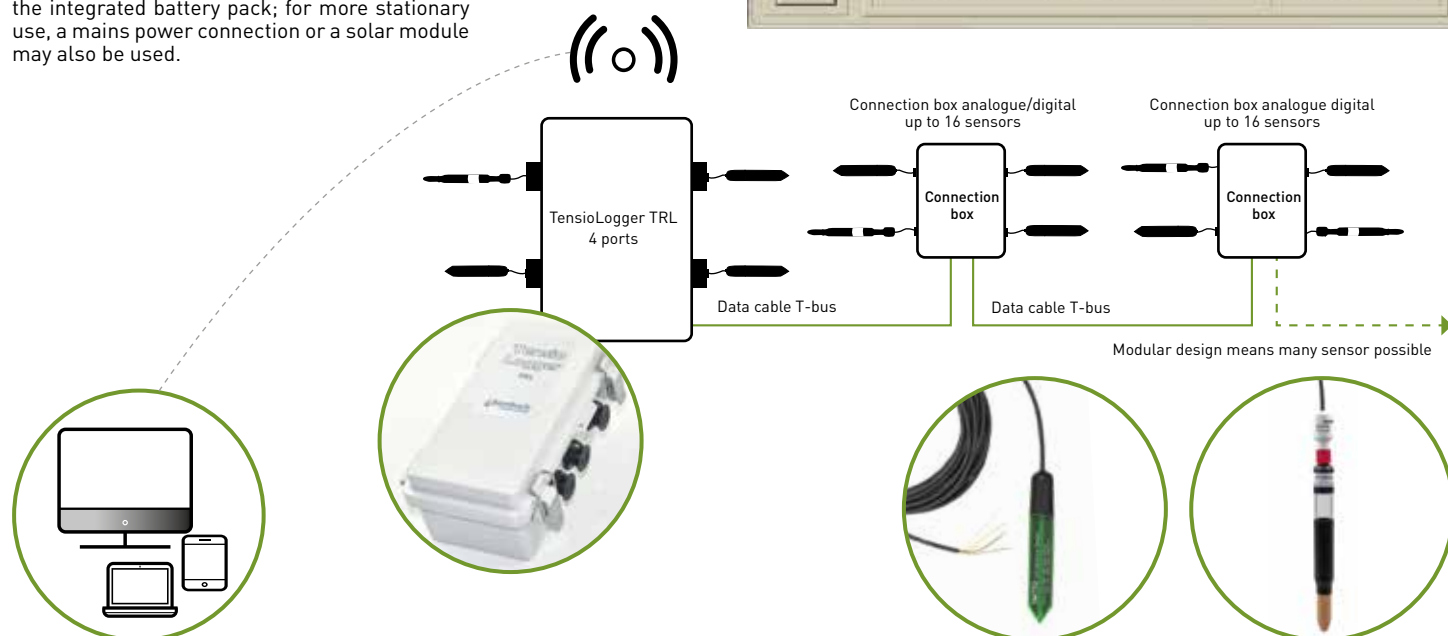
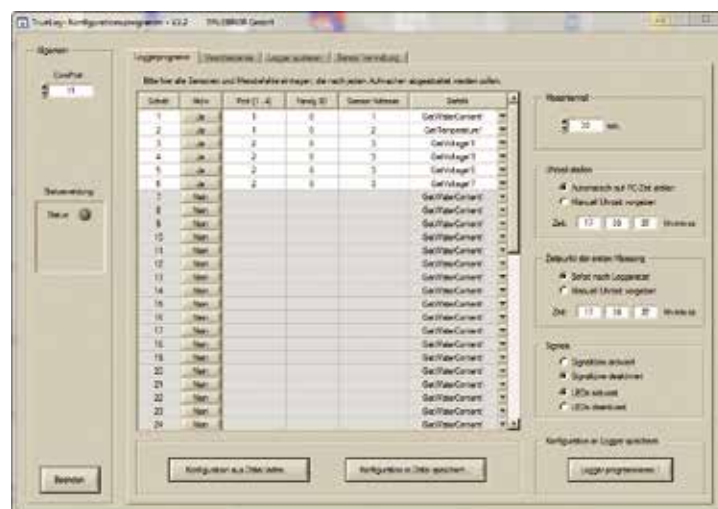
TensioLogger TRL

Using the TensioLogger, you can easily store and read out the measurement data for your volume sensors and tensiometers.

The TensioLogger has 4 digital interfaces. These can either be used to directly connect up to 8 digital sensors or for connecting expansion boxes. Further analogue or digital sensors can then be connected to such expansion boxes. This modular design enables you to simultaneously connect very many sensors to one TensioLogger unit.

Suitable software (which is installed on your PC) is provided for changing the TensioLogger settings and exporting the measurement data. The TensioLogger is connected to the PC via the USB cable supplied.

The TensioLogger can be supplied with power via the integrated battery pack; for more stationary use, a mains power connection or a solar module may also be used.



IRRIGATION CONTROL

TensioController

**TensioController**

A sensor-guided irrigation controller for any combination of sensors and valves, with pump activation/control, irrigation start according to sensor and timing, irrigation duration according to time and flow rate, alarms issued at limit values, operate via touch screen and/or remote maintenance via PC or smartphone.

Designs:

Base unit (CPU) + sensor or extension modules in compact housing (small unit) or in corresponding electrical cabinet (various versions) in rail/terminal mounting for cable connections; 24 VDC operations, mains supply.

Configurations:

Multiple combinations, practical small unit: Base unit (CPU) with 8 outputs + 1 module with 6 sensor inputs (partial assignment is also possible). Largest unit: Base unit + 14 modules with 120 valve outputs and 48 analogue sensors + additional connections (pump controls, etc.).

Usage:

Device can be operated using a touch screen, standard size 4.3" (11 cm) or recommended size 7" (18 cm), which is in the housing cover.

The easiest remote control method is using a VNC viewer (PC or smartphone) for internet (VPN) access to the router to which the Tensio-Controller is connected (Ethernet). The screen contains the display and operating software. The screen server enables it to be shared remotely.

Control variables:

Irrigation can be controlled according to the time, soil moisture and irradiation, either individually or in combination, depending on the particular sensor configuration. Tensiometers analog with E-sensors or volume sensors can be used as the sensors for soil moisture.

Software:

Groups of sensors and valves in 16 sectors, with from 1 to 3 sensors each + max. 8 valves + pump control, in any configuration. When there are several sensors per sector, the measured value is averaged. Valves and sectors can be operated in serially or in parallel. The irrigation runs according to sensor set-point + time and pause settings. Display with irrigation history, active valve and current measured values.

Special task: thermostat-controlled blow-out for pipes during winter irrigation; also suitable for preventing blockages during drip irrigation.

Monitoring:

Limit values for the humidity and pressure for controlling pumps, and for local alarms (individual signal transmitters) or via remote e-mail alarms. Monitoring the irrigation results using measured value monitoring with hysteresis and time settings.

Logging of measured values, irrigation or alarm dates enables extended monitoring functionality; log file can be saved to USB flash drive at the rear of the screen.

Planning specifications for TensioController:

- Number of solenoid valves?
- Power connection?
- IT connection (router)?
- Type of irrigation / water distribution?
- Pump control for irrigation?
- How should pumps be switched?
- Type of crop cultivation method?
- Size of the cultivated area in the open field or in the greenhouse?
- Number of sensors required?

TECHNICAL SPECIFICATIONS:

Screen: resistive LCD display TFT

Power supply for modules: Switched-mode power supply 24 VDC

Power supply for sensors: separate switched-mode power supply 24 or 12 VDC

Output solenoid valves: potential-free DC or AC / power supply unit or 24-V transformer
max. 24 per module + 16 with extension module

Supply for solenoid valves: Power supply unit or 24-V transformer

Sensor inputs: max. 6 per module

Sensor signals: 5 V, 10 V, 4 – 20 mA

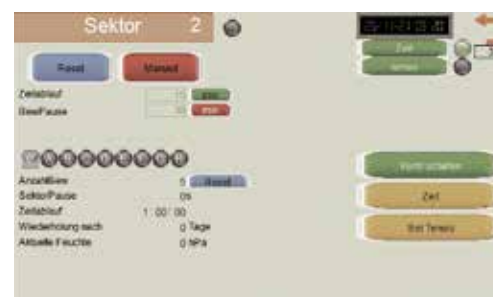
Flow measurement: 1 counter input with reed contact

Pump control: max. 16 pumps via switching output, optionally + relay

Frost monitoring: 1 thermostat input

ARTICLE NO.**TensioController**

with individual configurations to match the planning specifications



SOIL MEASUREMENTS

HYDRO 2000



Determining the volumetric water content in the soil

The HYDRO 2000 is an inexpensive measuring device for professional use. It determines the volumetric water content in soil. The SMT 50 sensor works according to the FDR (frequency domain reflectory) principle. It delivers precise results in the relevant measuring range between 0 and 50 % water content by volume, with only slight influences from salinity and soil type. The cable and housing for the sensor are waterproof. In addition to measuring soil moisture, the HYDRO 2000 can also measure the temperature of the soil. Thanks to its compact and robust design, this measuring device is maintenance-free and suitable for continuous operations.



The HYDRO 2000 can be optionally delivered with a cable connection for connecting further volume sensors (refer to page 44) and to handle additional measuring tasks.

ARTICLE NO.	
	HYDRO 2000
30008088	Hydro 2000 with permanently connected SMT 50 volume sensor, 1 m cable
30008089	HYDRO 2000 Hydro 2000 with plug connection
30008098	Volume sensor SMT 50 with plug for Hydro 2000, 2 m cable
30008100	Volume sensor SMT 100 with plug for Hydro 2000, 2 m cable
30008093	Aquaflex 100 cm with plug for Hydro 2000, 2 m cable
30008094	Aquaflex 300 cm with plug for Hydro 2000, 2 m cable

TECHNICAL SPECIFICATIONS:

	Sensor
Measuring range of SMT 50:	
	Volumetric soil humidity: 0 to 50 vol. % Temperature: -20 to +85°C
Measuring accuracy of SMT 50:	
	Volumetric soil humidity: ± 2% in mineral soils with average salinity ranging from 0 to 50% (VWC) Temperature: typically 0.8%
Cable length:	1.2 m
	Device
Resolution:	± 0.1 vol. %
Display:	Liquid crystal display
Power supply:	One nine-volt battery, size 6LR61
Degree of protection:	IP 40
Dimensions and weight:	125 x 78 x 45 mm, 190 g



SOIL MEASUREMENTS

SM150 soil moisture sensor



Measuring the volumetric soil moisture

The SM150 soil moisture sensor determines the volumetric soil moisture (m^3 water/ m^3 of soil = vol. %). It operates based on the FDR (frequency domain reflectometer) principle. An electromagnetic field of 100 MHz is generated by the transmitting rod in the probe. The permeability of the soil field is then measured by the receiving rod. The permeability depends on the water content of the soil, the soil type and the amount of entrapped air. A measure of the permeability of this electromagnetic field is the relative permittivity. Since the relative permittivity of water is much greater than that of soil or air, the measurable change in the electromagnetic field is determined mainly by the soil moisture.

This type of measurement has a very low sensitivity to the salt content (salinity), temperature, and soil type. For more accurate measurements, it is possible to distinguish between mineral (sand, loam, or clay) soils and organic soils.

Measurements from the SSM 150 soil moisture sensor can be displayed using the HH150 portable analysis unit.

Data from multiple SSM 150 sensors can be recorded using the GP1 data logger and then imported to a PC. The max. distance between the sensor and data logger is 100 m. Irrigation can be controlled by taking advantage of the programmable relay output.

ARTICLE NO.

30008049 HH150 KIT

Measurement kit for determining the volumetric soil moisture – consisting of the HH150 display unit (no storage memory), the SM150 probe and the portable case.

ACCESSORIES

30008042 SM150 soil moisture sensor

for connecting to the HH150

30008039 Tube extension, 100 cm

30008038 Tube extension, 50 cm

30008048 GP1 data logger

30008051 Connecting cable, 5 m

Additional accessories are available on request.

TECHNICAL SPECIFICATIONS:

Measurement range:	Soil moisture: 0 to 70 vol.%
Resolution:	0.1 vol.%
Accuracy:	± 3.0%
Salt-based error:	± 5% in a range of 1 to 10 mS/cm
Operating temperature:	-20 to +60 °C
Sample volume:	ø min. 70 mm, depth min. 55 mm
Power supply:	Two 1.5-V AAA batteries
Dimensions/Weight of SM150:	ø 40 mm, Length 143 mm, 0.1 kg

HUMIDITY ANALYSIS

CHAPTER 13

SOIL MEASUREMENTS

VG 200 soil moisture meter



The VG 200 is an affordable soil moisture meter for professional use.

It can measure soil moisture (in vol.%), ambient temperature and % brightness (related to full sun 100% and darkness 0%).

The temperature sensor can be calibrated by the customer for improved accuracy. A clock displays the current time.

The soil moisture sensor is waterproof and resistant to corrosion. It can be used for crop cultures as well as in natural soil.

TECHNICAL SPECIFICATIONS:

Measurement range:	Soil moisture: 0 to 70 vol. % Brightness: 0 to 100 % Temperature: -20 to +85 °C
Resolution:	Soil moisture: 1 vol % Brightness: 1% Temperature: 1 °C
Operating temperature:	-20 to +85 °C
Usable probe length:	94 mm
Cable length:	1 m
Power supply:	Two 1.5-V AAA batteries
Dimensions of device:	25 x 65 x 95 mm

ARTICLE NO.

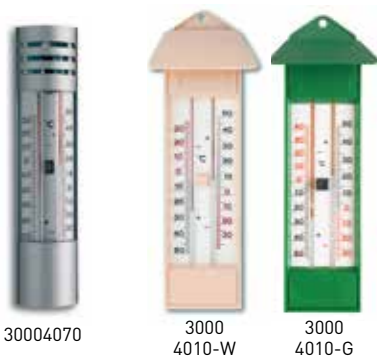
30008040 VG 200 soil moisture meter

Measuring device for determining volumetric soil moisture, brightness and temperature, comes with soil sensor and 1m attached cable



MIN/MAX THERMOMETER

Min/max thermometer



Min/max thermometer, made of aluminium or plastic, with easy-to-read scale. Measuring range: -38 to +50 °C. Mercury-free.

ARTICLE NO.	
30004070 Min/max thermometer	
	Black scale, 220 x 60 mm, 150 g
3000 4010-G Min/max thermometer	
3000 4010-W	230 x 79 mm, 120 g, green (G) or beige (W)

Min/max thermometer



Measures the indoor and outdoor temperature.

This wall thermometer with min/max function can simultaneously display the time and indoor and outdoor temperatures. All values can be displayed at the press of a button. The external temperature sensor is about 3 metres long. The display can switch between °C and °F.

TECHNICAL SPECIFICATIONS:

Measurement range:	Indoor temperature: -10 to +50 °C
	Outdoor temperature: -50 to + 60 °C
Power supply:	one 1.5-V AA battery

ARTICLE NO.	
30004022 Min/max thermometer	with indoor and outdoor thermometers

Min/max digital thermometer



Min/max digital thermometer for indoor and outdoor use. Optionally displays Celsius or Fahrenheit degrees. The thermometer is weatherproof.

TECHNICAL SPECIFICATIONS:

Measurement range:	-20 to +70 °C / -4 to 158 °F
Resolution:	0.1 °C
Power supply:	One 1.5-V AAA battery
Dimensions and weight:	81 x 30 x 150 mm, 81 g

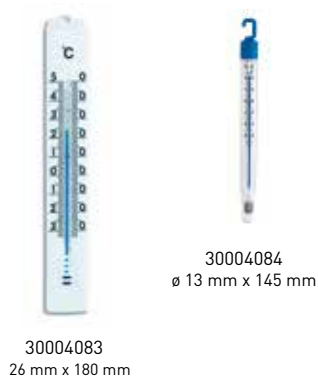
ARTICLE NO.	
30004012 Min/max digital thermometer	

TEMPERATURE MEASURING SYSTEMS

CHAPTER 14

ANALOGUE THERMOMETER

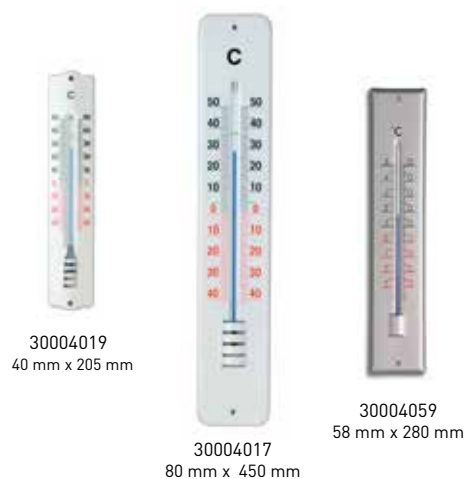
Plastic thermometer



Gardener's thermometer made of metal or plastic, in various sizes, with easy-to-read scale. Measuring range of metal thermometer: -40 to +50 °C

ARTICLE NO.	
30004083 Plastic thermometer	
	26 x 9 x 180 mm, 12 g, -30 to + 50 °C, white
30004084 Cooling thermometer, plastic	
	ø 13 x 145 mm, 10 g, -28 to +50 °C

Gardener thermometer



ARTICLE NO.	
30004019 Gardener thermometer	
	40 mm x 205 mm, 60 g, white, metal
30004017 Gardener thermometer	
	80 mm x 450 mm, 130 g, white, metal
30004059 Gardener thermometer	
	58 mm x 280 mm, 150 g, silver-grey, metal

Insertion-type and plastic soil thermometers



Soil thermometer for cost-effective measurement of soil temperature

Insertion thermometer Waterproof (splash water) bi-metal thermometer with stainless steel measuring rod and rod holder, for inserting into soil.

ARTICLE NO.	
30004086 Soil thermometer	
	29 x ø22 x 322 mm, 63 g, 0 to + 80 °C
30004225 Insertion thermometer	
	Display: ø 25 mm, -20 °C to +100 °C Measuring rod: ø 3.8 x 120 mm

DIGITAL THERMOMETER

Miniflash



Infra-red thermometer

Non-contact infra-red thermometer with minimum/maximum memory. Switchable between °C and °F. With automatic hold and lock functions for long-term operations. Perfect for measuring foliage and leaf surface temperatures.

TECHNICAL SPECIFICATIONS:

Measurement range:	-33 to +220 °C
Resolution:	0.1 °C
Accuracy:	± 1.5 °C (0 to +50 °C; otherwise 2 %)
Emissions ratio:	0.95, static
Optical resolution:	1.3: 1
Power supply:	CR2032 button cell
Dimensions and weight:	68 x 37 x 18 mm, 25 g

ARTICLE
NO.

30004286 Miniflash

Laser thermometer



Non-contact infra-red thermometer with point-laser sighting, backlit display and quick response time (<1 s, t 90).

TECHNICAL SPECIFICATIONS:

Measurement range:	-50 to +330 °C
Resolution:	0.1 °C
Accuracy:	± 2 °C (0 to 330 °C)
Operating temperature:	0 to +50 °C
Emissions ratio:	0.95
Optical resolution:	12: 1
Power supply:	One 9-volt battery, size 6LR61
Dimensions and weight:	32 x 78 x 133 mm, 97 g

ARTICLE
NO.30004287 Laser thermometer
0 to 330 °C, 12:1

Non-contact infra-red thermometer with circular laser sighting (measuring spot), backlit display and short response time (<1 s, t 90), adjustable alarm functions, minimum/maximum function.

TECHNICAL SPECIFICATIONS:

Measurement range:	Infra-red: -60 to +500 °C
Resolution:	0.1 °C (1 °C when over +200 °C)
Accuracy:	Infra-red: ± 2 °C or ± 2 % * Thermocouple: ± 1 °C or ± 1 % * (* the greater value applies)
Emissions ratio:	0.10 to 1.00, adjustable
Optical resolution:	12: 1
Power supply:	Two 1.5-V AAA batteries
Run time:	approx. 180 hours
Dimensions and weight:	141 x 134 x 42 mm, 186 g

ARTICLE
NO.30004285 Laser thermometer
with NiCr-Ni connection, type K

TEMPERATURE MEASURING SYSTEMS

CHAPTER 14

DATA LOGGER

Digital thermometer



Measures with insertion probe

Waterproof, digital all-purpose thermometer with insertion probe and approx. 60 cm cable. With table stand and mounting clip. Max/min and hold functionality. Switchable between °C and °F.

TECHNICAL SPECIFICATIONS:

Measuring range:	-40 to +200 °C
Resolution:	0.1 °C
Accuracy:	± 1 °C
Degree of protection:	IP 65
Dimensions and weight:	95 x 60 x 18 mm (without probe), 130 g

ARTICLE
NO.30004024 Digital thermometer with
insertion probe

Digital thermometer



Measures with insertion probe

This quick, insertable digital thermometer with min/max function comes with a protective sheath and clip.

TECHNICAL SPECIFICATIONS:

Measurement range:	-50 to +150 °C
Insertion depth:	120 mm
Accuracy:	± 1 %
Resolution:	0.1 °C
Power supply:	one 1.5-V AA battery, size "393"
Dimensions and weight:	165 x 35 mm, 20 g

ARTICLE
NO.

30004058 Quick digital thermometer

USB data logger



Measuring temperature and air humidity

The USB data logger records the temperature and air humidity in rooms. Using the supplied software, stored data can be easily evaluated on a PC. It can also be exported in various formats (e.g. as text or Excel files). The software can also be used for calculating the dew point and for setting visual alarms. The data logger software also runs on Windows 7.

TECHNICAL SPECIFICATIONS:

Measurement range:	Temperature: -20 °C to +70 °C Humidity: 0 % to 100 %
Accuracy:	Temperature: ± 0.3 °C Humidity: ± 0.3 %
Resolution:	Temperature: 0.1 °C
Operating temperature:	-20 to +70 °C
Measurement interval:	adjustable 10 s to 12 h
Measurement storage:	16,000 measurements
Communication:	USB interface
Run time:	approx. 3 years
Power supply:	3.6 V battery
Dimensions:	126 x 28 x 51 mm

ARTICLE
NO.

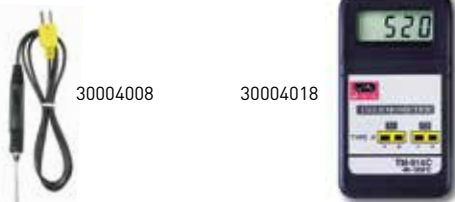
30004370 USB data logger

Data logger, bracket for wall mounting,
software, battery



DIGITAL THERMOMETER WITH EXTERNAL SENSORS

Temperature probes and digital thermometer



Digital thermometer for two sensors

with LC display for two external temperature probes. This quick and affordable instrument for displaying measurements is suitable for many applications.

TECHNICAL SPECIFICATIONS:

4009, 4020, 4030, 4089	
Measurement range:	-20 to +80 °C
Thermocouple:	Type K, class 1
Connection length:	45 cm, or approx. 1.7 m stretched
Digital thermometer	
Measurement range:	-40 to +1,200 °C
Resolution:	1 °C
Accuracy:	± 1 % +1 °C (0 to +750 °C)
Display:	Liquid crystal display
Power supply:	One 9-volt battery, size 6LR61
Dimensions and weight:	108 x 73 x 23 mm, 140 g

Temperature probes with NiCr-Ni components

Stainless steel temperature probes with NiCr-Ni component, available in various lengths for various applications. The 4009, 4020 and 4030 models of the probes are perfect for composting applications. Customer-specific versions are also available (for example, with a second temperature sensor for simultaneous probe measurements at 1 metre and 2 metre depths). Smaller probes are available for laboratory applications, cultivation systems or surface measurements.

ARTICLE NO.	
30004009	Temperature probe ø 12 mm, 1,000 mm
30004020	Temperature probe ø 12 mm, 1,500 mm
30004030	Temperature probe ø 12 mm, approx. 2,000 mm
30004089	Temperature probe ø 12 mm, approx. 3,000 mm
30004032	Temperature sensor: additional, at surcharge
30004053	Temperature cable probe ø 1 mm, welded with approx. 1 m cable
30004052	Temperature probe ø 3 mm, 80 mm
30004008	Temperature probe ø 3 mm, 120 mm
ACCESSORIES	
30004018	Digital thermometer for temperature probe
30004026	Mounting clip for temperature probe

TEMPERATURE MEASURING SYSTEMS

CHAPTER 14

DATA LOGGER

Compact data logger



30004310

Compact data logger

Data logger for temperature (T1, T3 and T4) to reliably measure, save and document data. The 175/176 series of compact data loggers are used for measuring temperatures. They are capable of storing up to 2 million measured values. In addition to the current values, the one-row display shows the min/max values and the specified limit values. Measurement data is not lost when the battery is empty or being replaced. Thus data loss is practically impossible. The data loggers have USB and SD card interfaces, so readouts are quick and easy.

The model 175-T3 (4310) – for monitoring compost temperatures – has been recommended by the German Community Composting Organization because it encourages hygienic compost techniques.

Required accessory:

Temperature probes with 8, 12, 100, 150 or 200 cm length (see above, art. no. 30004052, -4008, -4009, -4020, -4030). Different models are available depending on the type and number of measurement locations.

TECHNICAL SPECIFICATIONS:

Model 175-T3	
Measurement range:	-50 to +1,000 °C
Resolution:	0.1 °C
Accuracy:	± 0.5 % (-50 to +70 °C) ± 0.7 % (70.1 to +1,000 °C)
Measurement storage:	1 million readings
Measurement intervals:	adjustable 10 s to 24 h
Operating temperature:	-20 to +55 °C
Power supply:	Three AAA AIMn batteries
Run time:	approx. 3.0 years with a 15-min. measuring interval
Degree of protection:	IP 65
Dimensions:	89 x 53 x 27 mm

ARTICLE NO.	
30004330	175-T1 data logger 1x temperature, internal
30004310	Data logger 175-T3 2x NiCr-Ni, external, type K
30004311	Data logger 176-T4 4x NiCr-Ni, external, type K
ACCESSORIES	
30004343	Spare battery for 176 -T4
30004348	One 1.5 volt, type AAA for 175 -T1 /-T3, (order three)
30004323	Software on USB flash drive

T2 data logger



30004305

T2 data logger

The data logger enables the precise monitoring and recording of the temperature. An internal sensor for temperature monitoring as well as two external connections (type K), USB interface for automatic data transfer (as PDF) to your PC. A 5-minute measuring interval is pre-set. Configuration software is optional. (Save interval is adjustable from 10 seconds to 24 hours). Alarm issued when certain limit values are exceeded or not reached. Integrated motion detector for recording and documenting vibrations. There is a status and alarm LED under the display. This device has a high/low function and a time marker.

TECHNICAL SPECIFICATIONS:

Model T2	
1 temperature internal, 2 NiCr-Ni external, type K	
Measurement range:	-150 to 1,370 °C
Resolution:	0.1 °C
Measurement storage capacity:	approx. 60,000 data sets
Power supply:	1 x 3.6 V ½ AA
Wall bracket:	yes

ARTICLE NO.	
30004305	Data logger

ANALOGUE THERMOMETER

Compost thermometer



Bi-metal thermom measurements

Bi-metal thermometer for long-term stationary measurements in compost or piles. Designed with measurement probe and handles.

Other ranges or lengths (up to 4 m) available on request.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to +120 °C
Accuracy:	Class 1 (1 %)
Display:	ø 80 mm
Measuring rod:	ø 13 mm



ARTICLE NO.	
30004051	Compost thermometer 0.5 m, 0 to +120 °C
30004006	Compost thermometer 1.0 m, 0 to +120 °C
30004007	Compost thermometer 1.5 m, 0 to +120 °C
30004078	Compost thermometer 2.0 m, 0 to +120 °C
30004081	Compost thermometer 2.5 m, 0 to +120 °C
30004260	Calibration certificate Measurement at three points

Bi-metal thermometer



Bi-metal thermometer for stationary continuous measurements in soil, from -20 to +60 °C. Extended temperature range: 0 to +120 °C for steaming. Featuring a stainless steel measuring rod (6 mm diameter) and display (50 mm diameter). Optionally available with measuring head made of glass/stainless steel and 63 mm diameter.

TECHNICAL SPECIFICATIONS:

Measurement range:	Soil: -20 to +60 °C; vapours: 0 to +120 °C
---------------------------	---

Accuracy (glass / stainless steel ø 63mm):	Class 1
Display:	ø 50 mm, (glass / steel) ø 63 mm (glass / stainless steel)

Material:	Stainless steel measuring rod Glass/steel or glass/stainless steel measuring head
------------------	--

ARTICLE NO.	
Soil thermometer for max. 60 °C	
30004001	200 mm, ø 6 mm
30004002	300 mm, ø 6 mm
30004003	400 mm, ø 6 mm
30004004	500 mm, ø 6 mm
30004206	300 mm, class 1, ø 4.2 mm
30004208	500 mm, class 1, ø 4.2 mm
Vapour up to 120 °C	
30004016	300 mm, ø 6 mm
30004005	500 mm, ø 6 mm
30004242	300 mm, class 1, ø 4.2 mm
30004243	500 mm, class 1, ø 4.2 mm
30004260	Calibration certificate Measurement at three points



Temperature measuring lance with digital display



This temperature measuring lance allows you to monitor the temperature curve in your warehouse. So, when necessary, you can intervene promptly and prevent losses caused by insects and fungi. The lance and the handle are made of stainless steel. The temperature sensor, display and the wiring are in the stainless steel tube. It is versatile and can be used at temperatures up to 110 °C. The temperature measuring lance can be used for monitoring temperatures in hay, straw, grain, wood chips, compost and other bulk materials.

The 50-cm temperature measuring lance (4128) has no handle. A plastic cap is available as an accessory.

TECHNICAL SPECIFICATIONS:

Measurement range:	-50 to +110 °C
Accuracy:	± 1 °C
Lance length:	0.5 m, 1.5 m or 2.8 m
Lance diameter:	16 mm
Material:	+5 to +40 °C
Protection degree with cover:	IP 65
Display:	Liquid crystal display
Power supply:	One LR44
Weight:	1.95 kg



ARTICLE NO.	
30004128	Temperature measuring lance 50 cm, with digital display
30004028	Temperature measuring lance 1.85 m with digital display and handle, 2-piece
30004029	Temperature measuring lance 2.8 m with digital display and handle, 3-piece

ACCESSORIES	
30004127	Plastic cover cap

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MEASURING THE ILLUMINATION STRENGTH

Lux-Meter



The Lux-Meter is a high-precision digital light meter with three different measuring ranges. The sensor connects to the meter using a stretchable spiral cable which allows you to easily take precise point measurements.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 2,000 lx / 20,000 lx / 50,000 lx
Resolution:	1 lx, 10 lx, 100 lx
Accuracy:	± 5 % +2 dig.
Display:	Liquid crystal display
Measuring rate:	0.4 seconds
Output voltage of sensor:	0.1 mV per 10 lx
Moisture range:	max. 80 % rel. humidity
Power supply:	One 12-volt battery, size A23
Run time:	approx. 200 hours
Dimensions and weight:	188 x 64.5 x 24.5 mm, 160 g

ARTICLE NO.
30004050 Lux meter, in a case and with Light Guidebook

30004077 Light Guidebook

Lux-Multi



The professional Lux-Multi measures four different forms of light: sun light, fluorescent lamp light, sodium-vapour lamp light and mercury-vapour lamp light. This meter features a min/max/average function, a hold function, and a zero-compensation function.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 2,000 lx / 20,000 lx / 100,000 lx
Resolution:	1 lx, 10 lx, 100 lx
Accuracy:	± 5 % +2 dig.
Display:	Liquid crystal display
Operating temperature:	0 to +50 °C
Moisture range:	max. 80 % rel. humidity
Power supply:	One 9-volt battery, size 6LR61
Dimensions and weight:	180 x 72 x 23 mm, approx. 335 g

ARTICLE NO.
30004054 Lux-Multi with Light Guidebook

30004077 Light Guidebook

Lux-Mega



The Lux-Mega is a high-precision digital light meter that features five different measuring ranges. It can measure four different types of light: sun light, fluorescent lamp light, sodium-vapour lamp light and mercury-vapour lamp light. It has a min/max/average function, a hold function, an RS 232 interface and a zero-compensation function.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 40 lx / 400 lx / 4,000 lx / 40,000 lx / 400,000 lx
Resolution:	0.01 lx / 0.1 lx / 1 lx / 10 lx / 100 lx
Accuracy:	± (3% +5% meas. range end value); <100,000 lx
Display:	Liquid crystal display
Humidity range:	max. 80%
Operating temperature:	0 to +50 °C
Power supply:	One 9-volt, 006P, MN1604 (PP3)
Dimensions and weight:	200 x 68 x 30 mm, 220 g

ARTICLE NO.
30004080 Lux-Mega with Light Guidebook

30004077 Light Guidebook

LIGHT ANALYSIS

CHAPTER 14

MEASURING THE PHOTON FLUX DENSITY

GLOBAL 2000



The GLOBAL 2000 can be used to measure global solar radiation in a wavelength range of 300 – 1100 nm. This device precisely records both direct solar radiation and diffuse sky radiation. It then displays this as irradiance intensity in W/m². Thanks to its cosine-corrected sensor, a precise measurement can be made at any time of day. This makes the GLOBAL 2000 ideal for use in agriculture and research.

TECHNICAL SPECIFICATIONS:

Measurement range:	Irradiance intensity: 0 to 3,000 W/m ²
Operating temperature:	-10 to 55°C
Linearity:	< 1% (up to 3,000 W/m ²)
Resolution:	0.01 W/m ²
Cosine correction:	corrects up to 80° angle of incidence
Display:	Liquid crystal display
Degree of protection:	IP 40
Power supply:	One nine-volt battery, size 6LR61
Dimensions and weight:	125 x 75 x 45 mm, 190 g

PAR 2000



The PAR 2000 measures the photosynthetically active radiation (PAR) in the wavelength range between 400 – 700 nm. It is mainly in this range that incoming radiation is used by most plants for photosynthesis and thus for producing energy. The measurement is performed by determining the photon flux density, which describes the quantity of incoming light quanta per area and time.

TECHNICAL SPECIFICATIONS:

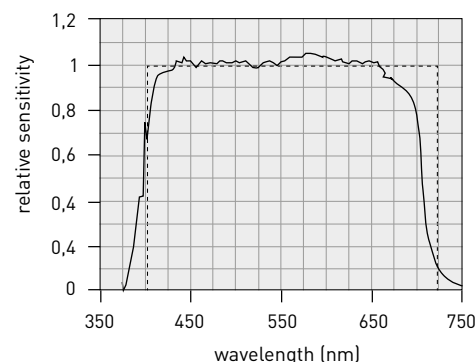
Measurement range:	PPFD: 0 to 10,000 µmol/m ² /s
Operating temperature:	-10 to 55°C
Linearity:	<1% (up to 10,000 µmol/m ² /s)
Resolution:	0.01 µmol/m ² /s
Cosine correction:	corrects up to 80° angle of incidence
Display:	LCD display
Degree of protection:	IP 40
Power supply:	One nine-volt battery, size 6LR61
Dimensions and weight:	125 x 75 x 45 mm, 190 g

ART.-NR.

30004071 GLOBAL 2000 with Light Guidebook

30004072 PAR 2000 with Light Guidebook

The PAR 2000 can be used for measurements under artificial light sources, global sunlight and a mix of different radiation sources. It is suitable for professional usage, both outdoors and indoors.



MEASURING WIND FORCE

Manual wind gauge



SKYWATCH Explorer

For measuring the current wind strength and maximum speed, and, with the Explorer 2, also the ambient temperature and the temperature felt by the body (wind chill).

Choice of units for wind (km/h, mph, knots, m/s and fps) and for temperature (°C and °F).

TECHNICAL SPECIFICATIONS:

Measurement range: Wind speed: 0 to 150 km/h
Temperature: -50 to +100 °C

Resolution: Wind speed: in tenths to 99.9 then full unit
Temperature: 0.1 °C

Accuracy: Wind speed: ± 3%

Operating temperature range: -30 to +60 °C

Dimensions and weight: 41 x 93 x 17 mm, 51-52 g

ARTICLE NO.
30004240 Wind gauge Explorer 2
30004241 Wind gauge Explorer 1

RAIN GAUGE

Wireless rain monitor and temperature monitor



Rain monitor with wireless rain gauge

Wireless rain monitor for wireless transmission of rain quantity and temperature (max. 30 m range). The rain monitor empties itself automatically. The display shows the total rain quantity since the last reset, the rain quantity in the previous hour and previous 24 hours, and the last time of rain. A bar graph on the display shows rain over the last 7 days, weeks or months. There is also a temperature and rain alarm function with time/date.

TECHNICAL SPECIFICATIONS:

Measurement range: Rain quantity: 0 to 9,999 mm

Indoor temperature: -10 to +50 °C

Outdoor temperature: -50 to +70 °C

Power supply: Three or two 1.5-V AA batteries

Dimensions and weight: 122 x 94 x 25 mm
ø 132 x 160 mm, 630 g

ARTICLE NO.
30004190 Wireless rain monitor

Rain gauge



Plastic rain gauge

with scale showing the amount of rain, in litres/m². Model with basket, pole fitting or rotary ring for keeping track of monthly rainfall levels.

ARTICLE NO.
30004011 Rain gauge Pole fitting
30004204 Rain gauge with basket

HYGROMETER

CHAPTER 15

AMBIENT MEASUREMENTS

Hygrometer with indoor/outdoor thermometer



Measuring humidity and temperature

Wall hygrometer with indoor/outdoor thermometers and minimum/maximum feature. All values can be displayed at the press of a button. The external temperature sensor has a length of approx. 3 m.

Switchable between °C and °F.

TECHNICAL SPECIFICATIONS:

Measurement range: Indoor temperature: -10 to +50 °C
Outdoor temperature: -50 to +70 °C

Humidity: 25 % to 98 % relative humidity

Power supply: one 1.5-V AA battery

ARTICLE NO.
30004025 Hygrometer with indoor/outdoor thermometers

Pocket hygrometer with thermometer



Measuring air humidity and temperature

Pocket-sized meter for measuring temperature and humidity. It saves the minimum and maximum temperature and humidity values. It features a fast-update display and is suitable for use in refrigerated warehouses, greenhouses or similar. It can display values in either °C or °F.

TECHNICAL SPECIFICATIONS:

Measurement range: Temperature: -20 to +50 °C
Humidity: 10 % to 95 % relative humidity

Resolution: Temperature: 0.1 °C;
Air humidity: 1%

Accuracy: Temperature: ± 1 °C
Air humidity: ± 5 % for 30 to 80 % rel. humidity, otherwise 7 %

Dimensions and weight: 150 x 20 x 16 mm, 40 g

ARTICLE NO.
30004027 Pocket hygrometer with thermometer

High-precision hair hygrometer



Measuring air humidity

This highly precise hair hygrometer measures the relative air humidity. The instrument features a silver-coloured, chrome-steel housing. It has an easy-to-read diameter of 103 mm.

TECHNICAL SPECIFICATIONS:

Measurement range: 0 to 100% rel. humidity

Scale divisions: 1 % rel. humidity

Accuracy: ± 3%

Operating temperature: -35 to +65 °C

Dimensions and weight: ø 103 mm, 80 g

ARTICLE NO.
30004033 High-precision hair hygrometer

WIRELESS WEATHER STATION

LPWAN wetter station

NEW



Weather station for remote monitoring

The weather station has many high-quality sensors that are connected to a radio unit via cable. The measurements are transmitted wirelessly via NB-IoT (SIM card) or LoRaWAN; this enables the station to work autonomously practically anywhere in the field. The radio module itself is powered by a long-life battery that guarantees a service life of several years. It can then be easily replaced.

The standard version of the weather station delivers the following measurement data:

- Air temperature,
- Relative humidity,
- Air pressure,
- Rain quantity,
- Wind speed and wind direction.

Additional sensors can optionally be added to determine:

- Soil moisture (SMT100, refer to page 40),
- Photosynthetically active radiation (PAR),
- Soil temperature.

The measured data is collected and can then be accessed via a clearly organised web-based dashboard. If you already have your own method for recording the data, the raw data can also be sent directly to your platform. Settings, such as measurement intervals or automatic notifications, can be changed individually for each measuring station using the dashboard.

When used together with our radio-controlled units for measuring soil moisture (FFF, refer to page 44), you can access data from the weather station combined with the soil moisture values in a compact overview. Thus, you quickly and easily get a complete overview of your key data.

TECHNISCHE DATEN:

Degree of protection:	IP65
Power supply:	2x 3.6 Volt, 14505(M) size
Transmission:	LoRaWAN
Resolution:	Temperature: 0.1 °C
Measurement ranges:	Temperature: -40 to 85 °C
	Humidity: 0 to 100% rel. humidity
	Air pressure: 300 to 1,100 hPa
	Wind speed: 0 to 150 km/h
	Wind direction: 8 positions
Accuracy:	Temperature 0.5 °C
	Humidity: ±3% rel. humidity
	Air pressure: 6 hPa
	Wind speed: ± 15%

ARTICLE NO.

30004750 LPWAN wetter station

Base station with temperature, humidity and air pressure sensors, as well as wind speed and wind direction measurements

Further parameters available on request



WEATHERHUB SYSTEM

WeatherHub Standard: The smartphone becomes a mobile air conditioner

Using various sensors, climate data can be monitored anytime and anywhere. Data from the past 90 days can be retrieved worldwide from multiple users. Free app for easy operations, configuring alarm limits with push notifications for alarms. Installation via an internet gateway.

Up to 50 sensors (868 MHz) and linkable devices can be connected. Compatible with iOS or Android® 4.0 (and higher).

WeatherHub PRO+

Transmitter with additional functions: including an 18-month history, graphic evaluation of the various values, max/min function and export function.

**WeatherHub starter set**

Gateway and transmitter with temperature sensor for indoor use

TECHNICAL SPECIFICATIONS:

	Starter set
Measurement range:	-30 to +60 °C
Range in free field:	approx. 100 m
Power supply:	Two 1.5 V AAA batteries

**ARTICLE NO.**

30004266	Starter set Gateway and temperature transmitter
30004267	Temperature transmitter with cable sensor, each -30to +60 °C
30004268	Thermo-hygro transmitter -40 to +60 °C, 1 to 99% rel. humidity
30004269	Thermo-hygro transmitter -40 to +60 °C, 1 to 99% rel. humidity

SMARTPHONE SYSTEMS

CHAPTER 17

WEATHERHUB SYSTEM

WeatherHub Sender PRO+/Observer

ARTICLE NO.	
3000 4267-A	Temperature transmitter with cable sensor, each -30to +60 °C
3000 4268-A	Thermo-hygro transmitter -40 to +60 °C, 1 to 99% rel. humidity
3000 4269-A	Thermo-hygro transmitter with cable sensor, -40 / -50 to +60 / +110 °C, 1 to 99% rel. humidity

WeatherHub rain gauge**Wireless rain gauge with many functions**

Determines rainfall amount, number of rainy days and average rainfall for the WeatherHub system. Additional 18 months history and graphical evaluation of values, min/max function and data export option. A gateway is required for operations.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 300 mm/h
Resolution:	0.25 mm
Range in free field:	approx. 100 m
Power supply:	Two 1.5-V AA batteries
Dimensions and weight:	ø 132 x 183 mm, 310 g

ARTICLE NO.

30004270 WeatherHub rain gauge

WeatherHub Solar wind gauge**Solar-powered wireless wind gauge with many features:**

Determines wind direction, wind force, wind gusts and maximum wind strength for the WeatherHub system. Additional 18 month history and graphical evaluation of the values, as well as min/max function and data export option. A gateway is required for operations.

TECHNICAL SPECIFICATIONS:

Measurement range:	Wind speed / gusts: 0.3 to 50 m/s Wind direction: 360°
Resolution:	Wind speed / gusts: 0.1 m/s Wind direction: 22.5°
Accuracy:	Wind speed / gusts: ± 1m/s < 8m/s, ± 10% > 8m/s
Range in free field:	approx. 100 m
Voltage/ supply:	solar cell with integrated battery Two Micro LR03 AAA alkaline batteries

ARTICLE NO.

30004256 Solar wireless wind gauge

WEATHERHUB SYSTEM

WeatherHub PRO⁺
WeatherHub weather station set
For climate and home monitoring with your smartphone

Weather station with thermo-hygro transmitter, Wireless rain gauge and solar wind gauge

- Retrieve the data anywhere, any time via smartphone, also accessible with multiple users, Free app.
- Transmitter for outdoor temperature and air humidity, rain gauge and rainfall amount, Number of rainy days, average rainfall amount, wind gauge with wind direction, wind force, gusts, and maximum wind strength.
- Current values in real time and historical data,
- Additional app functionality (graphics and overviews, max/min. function and data export), adjustable alarm limits, push messages for alarms, saves up to 90 days.
- Very easy installation via internet gateway
- Up to 50 sensors can be connected (868 MHz)
- System can be extended with many other types of transmitters
- Including gateway, thermo-hygro transmitter, rain gauge, wind gauge, power adapter for gateway, LAN cable

ARTICLE NO.

30004257 WeatherHub weather station

**TECHNICAL SPECIFICATIONS:**

Measurement range:	Temperature: -40 to +60°C
	Humidity: 0 to 99 % rel. humidity
	Rainfall amount: 0 to 300 mm/h
	Wind speed: 0 to 180 km/h
Compatibility:	iOS 7.0 or Android 3.2 (or newer), camera required

SMARTPHONE SYSTEMS

CHAPTER 17

WEATHERHUB SYSTEM

WeatherHub Observer

**WeatherHub Observer**

Web platform for professionally monitoring temperature and humidity. Display the measured data in a clear diagram, adjustable within fixed time ranges (day, week or month) for at least 90 days. Export the data as PDF (graphical) or CSV (text file). Automated monitoring is also possible. Send exported data via e-mail, with extensive alarm options. Can be used free of charge on Windows, Apple and Linux PCs or with Android®, iOS and Windows Phone. Completely browser-based and thus practically platform-independent.


WeatherHub starter set – Observer 1 with Thermo-hygro transmitter

WeatherHub Observer starter set with Thermo-hygro transmitter for monitoring temperature and humidity (indoor and outdoor)

TECHNICAL SPECIFICATIONS:

Measurement range:	Temperature: -40 to +60 °C
	Air humidity: 1 to 99% rel. humidity
Range in open field:	100 m
Power supply:	two 1.5 V, AA batteries

ARTICLE NO.

30004258 WeatherHub starter set Observer 1*

* Gateway with Thermo-hygro transmitter

30004259 WeatherHub starter set Observer 2*

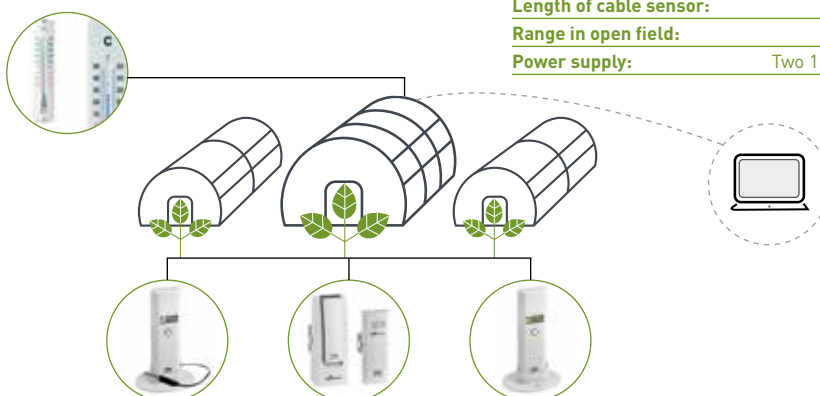
* Gateway with 3 temperature transmitters

WeatherHub starter set – Observer 2 with 3 temperature transmitters and waterproof cable sensor

WeatherHub Observer starter set with 3 temperature transmitters and waterproof cable sensor. For monitoring the indoor/outdoor temperatures and simultaneous monitoring of cooling equipment or liquids using cable sensors

TECHNICAL SPECIFICATIONS:

Measurement range:	Temperature: -30 to +60 °C
Length of cable sensor:	140 cm
Range in open field:	200 m
Power supply:	Two 1.5 V AAA batteries



MAGNIFIERS

Thread-counting magnifiers



TECHNICAL SPECIFICATIONS:

Magnification:	12-x / 8-x / 9-x / 6-x
Aperture:	10 x 10 mm / 20 x 20 mm / 10 x 10 mm / 25 x 25 mm
Housing:	Aluminium
Height:	23 mm / 39 mm / 30 mm
Scale:	1 mm [4421]

ARTICLE NO.	
30004410	Thread counter / folding magnifier 12-x
30004411	Thread counter / folding magnifier 8-x
30004421	Thread-counter with scale / folding magnifier [9-x]
30004419	Thread counter with indicator needle [6-x]

High-precision folding magnifier



TECHNICAL SPECIFICATIONS:

Magnification:	6-x / 10-x / 15-x
Diameter:	ø 22.8 mm
Lens optics:	Aplanatic silicate glass lenses
Housing:	Stainless steel
Frame:	Plastic, black

ARTICLE NO.	
30004412	High-precision folding magnifier 6-x
30004413	High-precision folding magnifier 10-x
30004414	High-precision folding magnifier 15-x
30004415	Black leather pouch

Illuminated magnifier



TECHNICAL SPECIFICATIONS:

Magnification:	10-x / 15-x
Lens optics:	with anti-static coating
Diameter:	ø 30 mm / ø 21 mm
Housing:	Plastic
Battery:	Three 1.5-V AAA battery

ARTICLE NO.	
30004420	Illuminated magnifier (10-x) with pouch
30004416	Illuminated magnifier (15-x) with pouch

MAGNIFIERS AND MICROSCOPES

CHAPTER 18

MICROSCOPES

Rod microscope



Refer to page 67 for printing /label details.

TECHNICAL SPECIFICATIONS:

Magnification:	40-x
Lens optics:	coated precision glass
Battery:	Two 1.5-V AA batteries

ARTICLE NO.	
30004430	Rod microscope with lighting

WIFI video microscope



WIFI video microscope with eight LEDs for magnification and display of videos and images on the smartphone or tablet. Real-time display on screen, measurement of objects.

TECHNICAL SPECIFICATIONS:

Camera sensor:	2.0 megapixels
Resolution:	1280x720 pixels
Focal length:	manual from 10 to 40 mm
Video format:	VGA
Image format:	JPEG, BMP, JPG
Magnification:	1x to 300x
Hardware:	iOS or Android
Interfaces:	USB 2.0 and USB 1.1
Dimensions and weight:	117 x ø 66 mm, 310 g

ARTICLE NO.	
30004426	WIFI video microscope Metal stand, calibration ruler

MAGNIFIER

Double pocket magnifier



Double pocket magnifier made of plastic

Magnification:	- 4x or 8x,
Lens diameters:	- 34 mm - with 2 lenses 4x / 8x

ARTICLE NO.	
30004400	Double pocket magnifier

SOIL MEASUREMENTS

Penetrometer



TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 40 bar
Scale:	3 colours for each tip type
Penetration depth:	max. 80 cm
Classification:	10 cm

Determining the soil density

The penetrometer is used to precisely determine the soil density. The stainless steel probe is scaled to mark the soil depth. The display features an easy-to-read colour scale. Plants living in dense soils can only absorb a limited amount of water and nutrients. Densely compacted soil also restricts the air exchange in the soil and reduces the N-mineralization.

This simple and sturdy hand penetrometer can measure the penetration resistance in soil. It is held vertically and then pressed into the soil with an even pressure on both hand grips. The easy-to-read colour display then shows an analogue reading of the penetration resistance.

The penetrometer is designed to detect compacted soil layers in agriculture and horticulture, sports and golf course maintenance, etc.

This allows you to perform generalized pedologic tests and basic foundation surveys (for determining the carrying capacity). You can also examine the expected growth conditions for plants and trees.

The penetrometer is delivered with two cone-shaped tips. The small cone (with the smaller surface) is used for solidly packed soils while the large cone (with the larger surface) is used for softer soils. There are two displays corresponding to the type of cone being used which are calibrated based on the cone's surface area.

ARTICLE NO.
30005090 Penetrometer Supplied with 2 tips and spacers
ACCESSORIES
30005091 Small tip (½")
30005092 Large tip (¾")
30005088 Spacer



SOIL DENSITY

CHAPTER 19

SOIL MEASUREMENTS

Soil probe



Detecting compacted soil layers and compacted areas left by ploughs

The stainless steel soil probe is a tool used for detecting (or probing) soil layer densities, water permeability levels, and soil types. It does not require the soil to be dug up. It can be used to detect zones within the topsoil layer which may disturb root growth (too loose or too dense soil) or to find compression zone caused by ploughs or tractors. It is also useful for detecting differences in soil types in the soil zone (for example, loess on clay or peat on sand).

The soil probe can also be used for tree care applications.

The soil probe is delivered with two cone-shaped tips. The cones have different surface areas; this allows you to measure in both compacted and loose soils.

TECHNICAL SPECIFICATIONS:

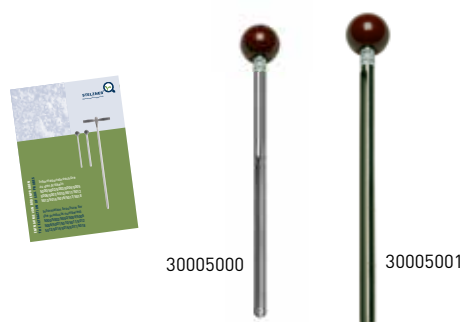
Measurement range:	1,000 mm
Markings:	every 100 mm
Dimensions and weight:	ø 8 x 1,150 mm, approx. 450 g

ARTICLE NO.
30005030 Soil probe Comes supplied with two tips
ACCESSORIES
30005031 Small tip
30005032 Large tip



SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Pot/volume sampling auger



Sampling auger for pots and container plants, also suitable for smaller planters and floriculture. Volume sampling auger, with scale, for removal of defined soil samples for purposes of NPK measurements (refer to page 19).

TECHNICAL SPECIFICATIONS:

Total length, groove length:	5000: 350, 200 mm
	5001: 350, 300 mm
Outer/inner groove ø:	16, 10 mm
Ball handle ø:	50 mm
Weight:	0.185 kg
Classification: (only 5001) 10 ml	

ARTICLE NO.
30005000 Sampling auger for pots
30005001 Volume sampling auger with scale

Hand-held sampling auger



Hand-held sampling auger with closed groove tip for potted and container plants, even with heavy rooting; Floriculture, tree nurseries.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	350, 210 mm
Outer/inner groove ø:	20, 17 mm
Ball handle ø:	50 mm
Weight:	0.32 kg

ARTICLE NO.
30005002 Hand-held sampling auger

Sampling auger



For all-purpose use with solid-built slim grip. Designed for the nitrate kit. Suitable for intensive-use glass-covered crops in natural soils and outdoor vegetables.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	500, 300 mm
Outer/inner groove ø:	20, 14 mm

ARTICLE NO.
30005004 Sampling auger

SOIL SAMPLING AUGER

CHAPTER 20

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Sampling auger



All-purpose sampling auger with solid-built wide grip. Suitable for glass-covered crops in natural soils and outdoor areas.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	560, 300 mm
Outer/inner groove ø:	17, 11 mm
Weight:	0.55 kg

ARTICLE NO.
30005003 Sampling auger, solid build

Sampling auger with foot rest



Auger with foot rest for outdoor crops with dense root zones. Solid-built handle and foot rest.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	810, 300 mm
Outer / inner groove ø:	20, 14 mm
Weight:	1.5 kg

ARTICLE NO.
30005006 Sampling auger with foot rest, solid-built handle

Sampling auger with foot rest



Auger with foot rest and extra-short groove – custom designed for grass and golfing applications. Solid-built grip and foot rest.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	810, 100 mm
Outer / inner groove ø:	20, 14 mm
Weight:	1.5 kg

ARTICLE NO.
30005007 Sampling auger with foot rest

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Standard type 60



Standard sampling auger for light soils. Solid handle, graduated at 300 mm.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	810, 600 mm
Outer / inner groove ø:	22, 15 mm
Weight:	1.25 kg

ARTICLE NO.
30005010 Standard type 60

Stripper for dislodging soil probes



Suitable for all sampling augers except for the pot/volume sampling auger (Article 30005000 / 30005001)

ARTICLE NO.
30005099 Stripper for dislodging soil probes

Puller for the Pürckhauer



Puller mechanism that latches onto the Pürckhauer. The Pürckhauer is then pulled out of the earth with a pumping motion.

TECHNICAL SPECIFICATIONS:

Stroke height:	750 mm
Stroke load:	350 kg
Weight:	2.3 kg

ARTICLE NO.
30005600 Puller for the Pürckhauer

SOIL SAMPLING AUGER

CHAPTER 20

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Type-60 Pürckhauer



Attachable auger grip with rubber sheathing and notch for removing soil samples. Features a slim design and light weight, with 10-cm divisions. Use for outdoor vegetables.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	1,000, 600 mm
Outer/inner groove ø:	25, 20 mm
Reinforced strike head, ø:	34 mm
Weight:	2.9 kg

ARTICLE NO.
30005011 Type-60 Pürckhauer
30005116 Spare drill handle for strike head with 34 mm diameter

Type-60 narrow Pürckhauer



Attachable auger grip with rubber sheathing and notch for removing soil samples. Features a short design and light weight, with 10-cm divisions. Use for outdoor vegetables.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	810, 600 mm
Outer / inner groove ø:	20, 13 mm
Strike head ø:	34 mm
Weight:	2.4 kg

ARTICLE NO.
30005012 Type-60 Pürckhauer
30005112 Replacement borer grip (narrow) for the strike head (ø 34 mm)

Type-90 Pürckhauer



Attachable auger grip with rubber sheathing and notch for removing soil samples. Mid-sized design, with 10-cm divisions, for all-purpose use.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	1,050, 900 mm
Outer / inner groove ø:	25, 17 mm
Diameter of reinforced strike head:	38 mm
Weight:	3.5 kg

ARTICLE NO.
30005014 Type-90 Pürckhauer
30005115 Spare drill handle for strike head with 38 mm diameter

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Pürckhauer Model 100,
robust version

Attachable auger grip with rubber sheathing and notch for removing soil samples. Total-cylinder design for pebbly soils, with conical tip. Extra strong auger for garden work. With 10-cm divisions.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	1,175, 1,000 mm
Outer / inner groove ø:	28, 18 mm
Diameter of reinforced strike head:	38 mm
Weight:	4.0 kg

ARTICLE NO.
30005016 Type-100 Pürckhauer
30005115 Spare drill handle for strike head with 38 mm diameter

Type-100 Pürckhauer



Attachable auger grip with rubber sheathing and notch for removing soil samples. Total-cylinder design made from steel tube for light, sandy soils. With 10-cm divisions.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	1,170, 1,000 mm
Outer / inner groove ø:	30, 24 mm
Diameter of reinforced strike head:	38 mm
Weight:	3.5 kg

ARTICLE NO.
30005017 Type-100 Pürckhauer
30005115 Spare drill handle for strike head with 38 mm diameter

Pürckhauer Model 100,
conical

Attachable auger grip with rubber sheathing and notch for removing soil samples. Solid-built with 60-cm tapered cone shape. For heavy, compacted soils containing clay. Extra sturdy construction. With 10 cm graduated divisions.

TECHNICAL SPECIFICATIONS:

Total length, groove length:	1,170, 1,000 mm
Outer diameter:	Top: 28 mm, bottom: 25 mm
Inner groove diameter:	18 mm
Diameter of reinforced strike head:	38 mm
Weight:	3.8 kg

ARTICLE NO.
30005018 Type-100 Pürckhauer
30005115 Spare drill handle for strike head with 38 mm diameter

SOIL SAMPLING AUGER

CHAPTER 20

SLEDGE HAMMERS

Simplex sledge hammer



Type-I Simplex sledge hammer:

Hammer length:	1050 mm
Weight:	7 kg
Striking surface ø:	125 mm
Head length:	215 mm

Type-II Simplex sledge hammer:

Hammer length:	1000 mm
Weight:	5 kg
Striking surface ø:	100 mm
Head length:	200 mm

Type-III Simplex sledge hammer:

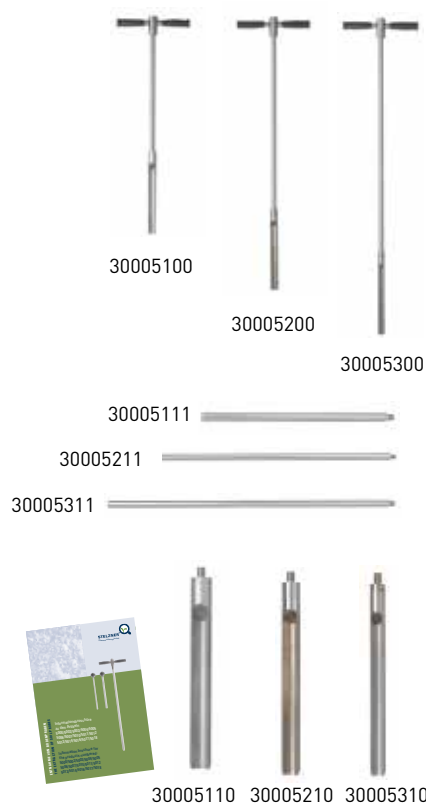
Hammer length:	800 mm
Weight:	3 kg
Striking surface ø:	80 mm
Head length:	105 mm



ARTICLE NO.
30005021 Type-I Simplex sledge hammer
30005022 Type-II Simplex sledge hammer
30005023 Type-III Simplex sledge hammer
ACCESSORIES
30005024 Plastic insert pairs for the 5021
30005025 Plastic insert pairs for the 5022
30005026 Plastic insert pairs for the 5023
30005027 Hickory handles for 5021, 900 mm
30005028 Hickory handles for 5022, 900 mm
30005029 Hickory handles for 5023, 700 mm
30005050 Special wrench tool
30005051 Cast handle for the 5021
30005052 Cast handle for the 5022
30005053 Cast handle for the 5023

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Multi-piece boring kits



Multi-piece boring kits / boring apparatus consists of shovel, rods, strike head and borer grip. For depths 0 to 30 / 30 to 60 / 60 to 90 cm.

Rubber sheathing and notch for removing samples can be attached to the borer grip. All individual parts are interchangeable.



ARTICLE NO.	
One-piece boring kit	
30005100	With one grip for 0 to 30 cm boring depth. Weight: approx. 4.0 kg
Two-piece boring kit	
30005200	With one grip for 0 to 30 / 30 to 60 cm boring depth. Weight: approx. 6.7 kg
Three-piece boring kit	
30005300	With one grip for 0 to 30 / 30 to 60 / 60 to 90 cm boring depth. Weight: approx. 10.0 kg
ACCESSORIES	
30005110	Shovel length: 30 cm, for 0 to 30 cm depth inner ø 32 mm, outer ø 38 mm
30005210	Shovel length: 30 cm, for 30 to 60 cm depth inner ø 26 mm, outer ø 34 mm
30005310	Shovel length: 30 cm, for 60 to 90 cm depth inner ø 21 mm, outer ø 28 mm
30005111	Rods for 0 to 30 cm, ø 22 mm, length: 50 cm
30005211	Rods for 30 to 60 cm, ø 22 mm, length: 75 cm
30005311	Rods for 60 to 90 cm, ø 22 mm, length: 90 cm
30005114	Strike head for all rods
30005115	Drill handle for strike head ø 38 mm

SOIL SAMPLING AUGER

CHAPTER 20

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Two-part boring kit



Two-piece boring kit for sampling of up to approx. 2 m, consisting of a Pürckhauer sampling auger, extension and rubber-coated borer handle, with sharp edge for stripping soil samples.

ARTICLE NO.	
30005500	Two-part boring kit up to approx. 2 metres. approx. 6.7 kg
30005501	Pürckhauer with screw-on strike head Total length approx. 1,185 mm, ø 22 mm
ACCESSORIES	
30005311	Rods for 60 to 90 cm, ø 22 mm, length: 90 cm
30005115	Drill handle for strike head ø 38 mm

Spoon auger – stainless steel



Multi-part, extendable stainless steel spoon auger with a custom-shaped spoon tip. It is used for taking samples from rough materials such as compost, bark mulch or wood particles.

TECHNICAL SPECIFICATIONS:

Base unit:	Overall length: 900 mm Drilling volume length: 300 mm Outer diameter drilling range: 88 mm Inner diameter drilling range: 8 mm Spoon slot in the insertion area: 70 mm
Extension:	Length: 650 mm Outer rod: 22 mm, Inner rod: 16 mm

ARTICLE NO.	
30005040	Base unit
30005041	Extension

Stainless steel cross-section spade



Cross-section spade, multi-piece, for examining grass sections on a golf course or sport field.

TECHNICAL SPECIFICATIONS:

Weight:	approx. 2.6 kg
Length:	Rods + 2 spade halves 750 mm, spade 200 mm

ARTICLE NO.	
30005900	Stainless steel cross-section spade
	Other spade lengths are available on request.

NUTRIENT ANALYSES

NANOCOLOR® 500 D and PF 12



Photometric nutrient analysis

The NANOCOLOR® 500 D and PF 12 digital photometers are the next innovative step for our photometric product line. These instruments can be used for any water or waste water analysis task and are perfectly suited to meet the present and future requirements of our customers. The NANOCOLOR can be used in industrial or municipal waste water management, drinking water supply, ground water, surface water, coolant water and boiler water systems, and soil analysis. The state-of-the-art illuminated graphic display is menu driven and capable of clearly displaying all key information (measured result, date/time, sample number, etc.). The display also shows when measurements do not lie within the specified measurement ranges.

Measurements that exceed the measurement range can be queried in order to evaluate the dilution used.

TECHNICAL SPECIFICATIONS:

	PF 12
Type:	Microprocessor controlled filter photometer: auto-test and auto-calibration functions; wavelength range: 340 to 860 nm
Lens optics:	Automatic filter wheel with 7 interference filters Sensitive to ambient light: for quick measurements with uncovered cuvette shaft
Wavelengths:	345 / 436 / 470 / 540 / 585 / 620 / 690 nm plus one compartment for an additional filter
Accuracy:	± 2 nm, halfwidth of 10 to 12 nm
Light source:	Tungsten lamp
Detector:	silicon photocell
Zero compensation:	automatic
Measuring modes:	more than 100 pre-programmed tests (NANOCOLOR® tube tests and VISOCOLOR® ECO tests), absorbance, transmission, factor, standard, 10 custom-programmable methods
Measurement range:	± 3 E
Accuracy:	± 1%
Long-term stability:	< 0.002 E/h
Cuvette holder:	Round cells 16 mm OD
Data memory:	200 measured values, GLP-compliant
Display:	Illuminated graphic display, 64 x 128 pixels, All key data is available at a glance: Result displayed with dimension specification, date, time, sample number, sample location and dilution
Usage:	Intuitive menu navigation, membrane keypad
Interfaces:	USB 2.0
Update:	Free updates available via Internet/PC
Operating range:	0 – 50 °C, up to 90 % relative humidity
Power supply:	USB power adapter, batteries or rechargeable batteries
Housing:	Waterproof, IP 67
Dimensions and weight:	215 / 100 / 65 mm, 0.7 kg

NANOCOLOR® 500 D

The auto-save function can be turned on and off in the configuration menu. Up to 3,000 on-site measurements can be made using the built-in heavy-duty high-power battery with charge controller. The unit can also be continuously operated using 220/110 VAC. A battery-status icon is shown on the display. The photometer has a power-saver mode where it can be set to shut-off automatically when not used (for either 10, 20 or up to 120 minutes). An integrated laser scanner which is used for fully-automatic instant cuvette detection results in routine analyses that are quick and simple. Round cuvettes (14-mm ID) and rectangular cuvettes (10, 20 and 50 mm) can be used without any adapters. Ten languages can be selected in the configuration menu.

	NANOCOLOR® 500 D
Type:	Microprocessor controlled beam-filter photometer: auto-test and auto-calibration functions; wavelength range: 340 to 860 nm
Lenses:	automatic filter wheel with 10 interference filters
Wavelengths:	345 / 365 / 436 / 470 / 520 / 540 / 585 / 620 / 690 / 800 nm plus 2 compartments for extra filters
Accuracy:	± 2 nm, half-width 10 to 12 nm
Light source:	Tungsten spotlight lamp
Detector:	silicon photocell
Zero compensation:	automatic
Measuring modes:	over 100 pre-programmed tests, 99 user-programmable methods absorbance, transmission, factor, kinetic, 2-point calibration
Measuring range:	approx. 3 E, unsigned
Accuracy:	± 1 %
Long-term stability:	< 0.002 E/h
Cuvette holder:	Round cuvettes 14 mm ID, Rectangular cuvettes 10, 20, 50 mm
Data memory:	500 measurement value records, GLP-compliant
Display:	graphical back-lit display, 64 x 128 pixels, 10 languages
Usage:	bar codes, display menu, membrane keypad
Interfaces:	USB 1.1 and bi-directional RS232 serial ports
Update:	via Internet / PC
Operating range:	0 to +50 °C, up to 90 % relative humidity
Power supply:	100 to 240 VAC, 50/60 Hz / 6 VDC, 3.2 Ah, via built-in rechargeable battery, with charge controller and power supply unit
Dimensions and weight:	227 x 282 x 105 mm, 2.4 kg

ARTICLE NO.

30001850 All-purpose photometer
NANOCOLOR® 500 D

30001801 All-purpose photometer PF12

Including software CD, operations manual, dust cover, power supply unit, data cable, USB cable and calibration cuvette, in a sturdy travel case.

ACCESSORIES

30001810	Nitrate NO ₃ -N, 0.3 to 22 mg/l; 20 per package
30001812	Ammonium NO ₄ -N, 1 to 40 mg/l; 20 per package
30001813	Phosphate P ₂ O ₅ , 10 to 50 mg/l; 19 per package
30001814	Potassium K, 2 to 50 mg/l; 20 per package
30001815	Magnesium Mg, 5 to 50 mg/l Calcium Ca, 10 to 100 mg/l; 20 per package
30001817	Iron Fe, 0.1 to 3.0 mg/l; 20 per package
30001818	Copper Cu, 0.1 to 7.0 mg/l; 20 per package
30001819	Zinc Zn, 0.1 to 4.0 mg/l; 20 per package
30001820	Molybdenum Mo, 1.0 to 40 mg/l; 20 per package
30001821	Manganese Mn, 0.1 to 10 mg/l; 20 per package
30001822	Chloride Cl, 0.5 to 50 mg/l; 20 per package
30001823	Sulphate SO ₄ , 10 to 200 mg/l; 20 per package
30001851	Stand for 15 round cuvettes and 2 extraction vessels
30001803	Digital piston pipette 0.2 to 1.0 ml, adjustable, with tip ejection mechanism
30001804	Plastic tips (blue) for piston pipette 1860, 1803; 100 pieces
30001808	Digital piston pipette, 1.0 to 5.0 ml, adjustable, with tip ejection mechanism
30001809	Transparent plastic tips for cylinder-stroke pipette no. 1808; 100 pieces
30001860	Piston pipette 0.2 to 1.0 ml, adjustable, with tip ejection mechanism



PREPARING THE SAMPLE

Thermoblock



Equipment for sample preparation

Programmable Thermoblock for dissociative chemical analysis of samples. Easy to operate symbol buttons, pre-programmed standard programs for all routine extractions, and application-specific analysis methods. Also features high level of temperature stability and quick heat-up time. It is possible to analyse 12 round cuvette samples (with 16 mm outer diameter) simultaneously.

TECHNICAL SPECIFICATIONS:

Display:	2 LED displays with 6-mm character height Temperature and residual display
Usage:	Membrane-covered symbol buttons with entry confirmation
Operating temperature:	+30 to +160 °C (step size 1 °C)
Temperatures:	5 pre-programmed temperatures 70 / 100 / 120 / 148 / 160 °C
Heat-up time:	From +20 to +160 °C within ten minutes
Heating intervals:	4 pre-programmed heating intervals Time range: 0:01 h to 99:59 h (step size 0:01 h)
Safety features:	Interchangeable safety cover for touch protection, Integrated hood, Over-heating protection
Communication:	RS232 connection option for NANOCOLOR® T Set (enables fully-automatic calibration and creation of a testing certificate for test-equipment monitoring in compliance with DWA – A 704) Update via PC
Power supply:	110 to 230 VAC, 50/60 Hz
Power consumption:	125 / 250 VA
Dimensions and weight:	155 x 250 x 140 mm, approx. 1.8 kg

ARTICLE NO.	
30001855	Thermoblock with hood and power cable
ACCESSORIES	
30001856	NANOCOLOR® T Set for calibration and temperature control

UM 200 cabinet drier



Equipment for sample preparation

Housing made from burnished stainless steel. Interior made from rust-free acid-proof stainless steel. With natural ventilation and mechanical temperature control. Heats up very quickly. Designed to a high safety standard. Including timer from 0 to 24 hours and two stainless steel push-in plates.

TECHNICAL SPECIFICATIONS:

External dimensions:	550 x 600 x 400 mm
Internal dimensions:	400 x 320 x 250 mm
Volume:	32 litres
Operating temperature:	30 to 220 °C
Voltage:	220 V 1/N
Power:	1100 kW
Weight:	29 kg

ARTICLE NO.	
30006100	Cabinet drier UM 200 with fully-insulated stainless steel door

Labotherm LS muffle furnace



Equipment for sample preparation

Muffle furnace with stainless steel housing and high-quality insulation. Switching system in lower section of furnace featuring a user-friendly, dust-proof membrane keyboard.

- Separate ON/OFF switch
- Precise programming in 1 °C steps or 1 min. intervals
- Adjustable increase in heat-up time

TECHNICAL SPECIFICATIONS:

External dimensions:	400 x 530 x 450 mm
Internal dimensions:	200 x 130 x 180 mm
Maximum temperature:	1,100 °C
Voltage:	230 V 1/N
Power:	2.4 kW
Weight:	33 kg

ARTICLE NO.	
30006200	Muffle furnace including switch / control system with controller
30006201	Flue with fan
30006202	Ceramic collecting tray



PREPARING THE SAMPLE

Strainer machine



Lab strainer machine and accessories

Strainer machine for the laboratory, for max. 16 analysis strainers, with 50-mm edge height, and up to 215 mm ø.

Dry and wet sieving/straining are both possible. Stainless steel strainers in compliance with DIN ISO 3310/1, with 200 mm diameter and 50 mm edge height. Additional sizes are available on request.



ARTICLE NO.	
30006080	Laboratory screening machine
ACCESSORIES	
30006054	63 µm
30006057	200 µm
30006060	630 µm
30006063	1.00 mm
30006064	2.00 mm
30006065	4.00 mm
30006062	5.00 mm
30006066	6.30 mm
30006068	10.00 mm
30006061	20.00 mm
30006069	Strainer cover
30006070	Collection base
30006071	Intermediate base
30006072	Intermediate ring
30006073	Base with run-off
30006074	Spare seal

LABORATORY EQUIPMENT

CHAPTER 21

PREPARING THE SAMPLE

Dewar vessel



Dewar vessel for determining the rotting degree

Dewar vessel made from silicoborate glass, silver plated, with metal sheathing. Enclosure made from zinc-plated iron sheet. Additional sizes are available on request.

TECHNICAL SPECIFICATIONS:

Temperature:	-196 to +600 °C
Capacity:	max. 1.5 l
Weight:	1.2 kg

ARTICLE NO.	
30006095	Dewar vessel

Desalination cartridge



Water purifier cartridge for non-pressurized desalination

Non-pressurized desalination cartridge made of plastic and filled with regenerating ion exchange resin. Incl. riser tube and Seran filter cloth, 1.5 m inlet hose, 0.5 m outlet hose. Desalinated water is immediately available after water supply is connected. Additional sizes are available on request.

TECHNICAL SPECIFICATIONS:

External dimensions, in cm: H x ø:	48 x 16
Flow rate:	50 l/h
Capacity (10 °dGH):	440 l
Weight:	5 kg

ARTICLE NO.	
30004031	Desalination cartridge
30004038	Connection kit Connection hoses, riser tube, flow-through electrode with EC meter
30004042	Regeneration

Laboratory accessories and individual components



ARTICLE NO.	
30002013	Measuring cup, 100 ml with graduation marks
30002044	Measuring cup, 250 ml with graduation marks
30002040	1-litre beaker with graduation marks
30002043	Powder funnel ø 80 mm
30002042	Liquid funnel ø 80 mm
30006000	Measuring cylinder, 1000 ml PE with elongated shape
30000580	Measuring cylinder, 250 ml PE with elongated shape
30000570	Measuring cylinder, 100 ml PE with elongated shape
30000560	Measuring cylinder, 10 ml PE with elongated shape



PREPARING THE SAMPLE

Scale



Spoon scale

Spoon scale for weighing small quantities. Practical weighing function for easily weighing larger quantities.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 300 g
Resolution:	0.1 g
Volume of spoon:	28.4 ml
Housing:	Plastic
Power supply:	One 1.5 volt CR2032 battery
Dimensions and weight:	25 x 50 x 230 mm, 90 g

ARTICLE NO.
30004061 Spoon scale

Scale



Electronic precision scale

Electronic precision scale for pesticides, seeds, etc. Switch: On/off, automatic tare, automatic shutoff / zero position calibration system available.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 500 g
Resolution:	0.1 g
Min. load:	0.1 g
Tray for scale:	Plate: ø 65 mm
Power supply:	One 1.5 volt CR2032 battery
Housing:	Plastic with tray
Dimensions:	118 x 78 x 16 mm

ARTICLE NO.
30004069 Electronic precision scale

Scale



Electronic precision scale

Electronic battery-operated precision scale for lab use.

Switch: On/off, automatic tare, automatic shutoff

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 500 g
Resolution:	0.1 g
Tray for scale:	Plate: ø 120 mm
Power supply:	Two 1.5-V AAA batteries

ARTICLE NO.
30004066 Precision scale with calibration weight of 200 g

LABORATORY EQUIPMENT

CHAPTER 21

PREPARING THE SAMPLE

Scale



Electronic SOLAR scale

Solar-powered pesticide scale for the lab, with reserve solar energy function.
Usage: less than 150 lux
Switch: On/off, automatic tare, automatic shutoff / zero position. Min. load: 2 g

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 2000 g
Resolution:	0.5 g (0 to 100 g)
Tray for scale:	Plate: ø 125 mm
Housing:	Plastic
Dimensions and weight:	196 x 125 x 65 mm, 410 g

ARTICLE NO.
30004062 Electronic SOLAR scale

Scale



Electronic scale

Electronic scale for pesticides with stainless steel plate. Battery operated.
Switch: On/off, automatic tare, automatic shutoff

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 2000 g
Resolution:	1.0 g
Weighing surface:	170 x 120 mm
Power supply:	One 3-Volt CR2032 size battery
Dimensions and weight:	220 x 140 x 23 mm, 3 kg

ARTICLE NO.
30004067 Electronic scale

Scale



Electronic pesticide scale

Electronic precision scale for pesticides, with RS232 port, including adapter and batteries.
Switch: On/off, automatic tare

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 5000 g
Resolution:	1.0 g
Weighing surface:	185 x 185 mm
Power supply:	Six 9-Volt batteries, or mains power connection
Weight:	3 kg

ARTICLE NO.
30004064 Electronic pesticide scale
30004068 Power supply unit

YOUR CUSTOMER NUMBER

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		Postage and handling *)	

* Within Germany: max. size of 1.20 x 0.60 x 0.60 m and max. weight of 25 kg, max. 18.00 €. Request rates for international delivery or for larger dimensions/weights.

Date

Signature

CUSTOM-PRINTED MARKETING ITEMS

Thermometer



Minimum/maximum plastic thermometer

with easy to read scale. Measuring range: -38 to +50 °C. Gardener thermometer made of metal in various sizes with easy to read scale; measuring range: -40 to +50 °C.

ARTICLE NO.
30004010 Min/max Thermometer
230 x 79 mm, 120 g

Moisture tester



Moisture meter

for your plants. The point indicates the soil moisture level. Operates without batteries. The long probe enables measurements deep in soil.

ARTICLE NO.
30008005 Moisture tester

Rain gauge



Plastic rain gauge

with scale showing the amount of rain, in litres/ m². Model with basket, pole fitting or rotary ring for keeping track of monthly rainfall levels.

ARTICLE NO.
30004011 Rain gauge Pole fitting
30004204 Rain gauge with basket

MARKETING ITEMS

CHAPTER 22

CUSTOM-PRINTED MARKETING ITEMS

Rod microscope



TECHNICAL SPECIFICATIONS:

Magnification:	40-x
Battery:	Two 1.5-V AA batteries

ARTICLE NO.
3000 4430-B Rod microscope with lighting





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