

Introduction

equipment and services

from Eijkelkamp Agrisearch Equipment



Contents:

- Equipment for soil research
- Penetrologger
- Laboratory research into physical soil characteristics
- Equipment for waterbed research
- Groundwater sampling
- e-SENSE and e+ sensors
- Monitoring well pipes and accessories
- Capacity Building
- Diver



All it takes for
environmental research

Equipment for soil research

Hand drilling equipment is extremely suitable for soil research. Because almost every type of soil requires special demands on the model of the auger to be used, various models have been developed through the years. Years of experience and many contacts with soil experts at home and abroad have led to the optimal design of the various types. Deeper holes can be bored, using extension pieces with bayonet or conical threaded connections. A drilling depth of approximately 8-10 metres is achievable using hand augers.

BENEFITS

Hand drilling equipment

- Wrought auger bodies with a high pulling strength
- Perfectly formed auger bodies for optimal drilling
- Non-toxic steel for all types of analysis
- Extension pieces quickly coupled



Ergonomic auger kit

To reduce the physical loads associated with soil drilling and the attendant risk of physical complaints, Eijkelkamp has developed an ergonomic soil auger system. This ergonomic soil auger system differs in a number of positive ways from the traditional soil auger. The ergonomic hand auger kit for heterogeneous soils is used, in an ergonomically responsible way, to drill holes and take samples in a very wide range of soil types, for general soil research and for sampling for among other things environmental research. Holes can be made to a depth of five metres, dependent on the depth of the water table, the soil profile and the nature of the material to be drilled. An auger type is available for every specific situation and for every soil type above or below the groundwater table. When drilling, the auger heads can be changed without problem.

A list of the advantages of the ergonomic auger kit:

1. The ratchet system ensures that the auger can be rotated through small angles
2. Considerably more drilling power due to the longer handle length
3. Improved posture due to tripple height adjustment
4. Impossible to work too low to the ground due to the stop button
5. Considerably reduced loads on hand, wrist, elbow and shoulder joints due to the ratchet principle, thick handgrips on the handle, greater turning moment and adjustable drilling height.

Applications:

- Profile description
- Chemical soil research
- Archaeological soil research
- Environmental soil research
- Monitoring well installation
- Making bore holes
- Soil classification
- Seismic soil research

Properties:

- Sampling depth : 5 m
Sample length : 10 cm
Hole diameter : 7 cm (larger or smaller is possible)
Furthermore : Suitable for all soil types, suitable for above and below the groundwater table. Nicer and simpler

BENEFITS

Ergonomic handgrip

- Always works at the right height
- Minimal stress to wrist, elbow and shoulder
- Less force needed due to a larger handgrip
- Ratchet system for short beats
- Turns both clockwise and anticlockwise



Accurate soil sampling: Necessary for reliable soil research

The basis for soil research is the study of the soil profile and the physical properties of the soil. The physical properties of the soil will be chiefly determined in the laboratory. Undisturbed samples are necessary for such laboratory research, preferably of the same dimensions. In order to meet this need, soil samples are taken in rings with a known volume and a known diameter. Various sampling sets have been developed for taking undisturbed samples in soil sample rings.

Soil sample ring kits

The sets differ from each other regarding the ring holder used, the diameter of the rings, the selected connection and the sampling method. We supply two standard sets:

- Sample ring set, model C, for all soil types to a depth of 2 m
- Sample ring set, model E, for very hard soil types to a depth of 2 m

The model C and E sampling sets can be used for taking samples from almost all types of soil. The samples can be taken from the surface as well as from drill holes or profile pits, both above and below the groundwater level. The closed ring holder in this set is supplied with a conical screw thread connection. This means that the ring holder can be hammered into the soil with a dead blow hammer. The set also includes at least the following: a closed ring holder, a handgrip with impact head, an Edelman and a Riverside auger, extension pieces, a hammering head with a guide cylinder, an aluminium case with soil sample rings and various accessories. The model C sampling sets are available for soil sample rings with a diameter of 53, 60 or 84 mm. The most used (standard) diameter is 53 mm (model E is only available in a diameter of 53 mm).

Soil sample rings

Soil sample rings are stainless steel rings made of seamless tubes with smooth inner and outer surfaces. The bottom of the ring has a cutting edge. The dimensions, and therefore the volume of the soil sample rings, are known exactly, which makes them highly suitable for laboratory research. Undisturbed soil samples can be taken using soil sample rings. To be used for:

- Determining the moisture level at various moisture tensions, from which a pF-curve can be made
- The water permeability
- The air permeability
- The weight per volume
- The density
- The soil-water-air balance in the field
- The pore distribution
- The oxygen diffusion

Soil sample rings are transported in strong special aluminium cases, strong and resistant against humidity and heat.

Hard soils

The hammer head with guide cylinder is used to fill soil sample rings in hard types of soil, both on the surface and in profile pits. The sample ring kits model C and model E can be used to take samples in more or less any type of soil.



BENEFITS

Soil sampling rings

- Available in three diameters
- Can be hammered (all soil types) into the ground
- Sampling ring protected by a closed ring holder





Soil coring kit

Taking soil samples to determine the presence of extremely volatile substances must be done using samplers that prevent the sample being exposed to the open air. These conditions must also be maintained during transport to the laboratory. Using the soil coring kit for chemical research, vaporisation and oxidation of the samples can be prevented as much as possible. The sample never comes in contact with a plastic. The method meets the requirements of NEN 5743 (sampling of soil or sediment that contains volatile compounds). The sample taken has a volume of 200 ml. The kit can also be used to determine the volume percentages of moisture in undisturbed soil samples.

Foil insertion kit for core samplers

For years, many field workers have had bad experiences with extracting samples from sample tubes by cutting or sawing. For this reason, Eijkelkamp developed a foil insertion kit. Using the foil insertion kit, thin polyurethane sampling foil can be inserted into the corers of a percussion gouge. The transparent plastic sample tube is replaced by a long section of plastic foil. The advantages are clear: much lighter material, the foil is easy to remove, the same quality result and not to be forgotten: much cheaper. The foil insertion kit can only be used in combination with 63 mm corers, that have a left-hand thread and RD32 connection.

BENEFITS

Percussion drilling set

- Ideal for gravel-rich soil types
- The solution for town centres/industrial parks
- Beautifully clean samples
- Extremely strong working parts
- Efficient, quick and light work
- Combination possible with foil or sample liner tube



Percussion drilling set

The percussion drilling set can be used to drill into hard soils. The percussion sampling kit is mobile and can be used to overcome various problems that cannot be tackled using hand operated drilling equipment. When using the percussion set, the gouges, which have a hardened steel cutting head, are driven into the soil using a hammer. This is done in stages to ease the insertion and removal of the gouges and to prevent contamination as far as possible. The percussion gouge can - also when hand-operated bailer boring is used - penetrate rubble and as a result can also be used on landfill sites and in urban areas. The percussion gouges can be used both above and below the groundwater table.

RD32 connections

In harder, dryer soils, such as in France, Poland, Spain and Portugal, RD32 connections are mainly used. RD32 stands for round thread connection (in Dutch: Ronde Draad verbinding). Here, percussion gouges and extension rods are connected together using a screwable sleeve. These can be connected and disconnected very quickly. The major advantage is that as a result, the solid extension rods can have the same diameter along their entire length, making them very strong. A standard extraction system can be used.



Penetrologger

BENEFITS

Penetrologger

- Strong and reliable
- Built-in quick GPS
- Soil moisture indicator optional
- Records one moisture percentage per measurement
- Comparison of details possible
- 500 digital details recorded
- Definition of various projects
- Every project can be chosen at any moment



The penetration resistance of the soil or shallow subsoil as measured using the penetrometer is a measure of the compaction or load-bearing capacity of the soil. High penetration resistance can be favourable for civil engineering in view of, for instance, the soil's suitability for foundations for buildings and infrastructure projects. In addition, this information is relevant for, for instance, the maintenance of trees and sports fields.

Penetrologger

The penetrometer is a device that has been specially developed to measure the penetration resistance of the soil and to automatically store the results for further processing by a PC. The penetrometer has an ergonomic design, is light weight and is easy to operate. It can be used for measurements up to a depth of 80 cm. The penetrometer gives the Cone Index (CI) per measurement.

The penetrometer comprises an accurate internal GPS-system to determine the exact measuring point. The coordinates recorded in the penetrometer can be linked to a place or map using software or the Internet. Optionally, a soil moisture sensor can be connected to take a single-point measurement of the percentage soil moisture at the measuring point. The sensor has a range of 5-55% and an accuracy of 5%. The soil moisture percentages are stored together with the coordinates and the measured penetration resistance. The penetrometer has a memory for no less than 1500 measurements. The robust, watertight plastic housing, containing the electronics, is equipped with four stainless steel measuring probes that can simply be pushed into the soil.

Applications:

- General soil research
- Basic recommendations for shallow foundations
- Checking the artificial compaction of the soil
- Research into the growing conditions of plants in the soil
- Checking the accessibility for cranes, trucks and army equipment
- Research into grass and sports fields

Hand penetrometer

The hand penetrometer is a useful instrument for general soil research and for providing simple advice concerning foundations. The hand penetrometer is also used to check artificial compaction, to determine site negotiability and in research aimed at determining the expected growing conditions of plants in the soil or tracing compacted soil strata.

Penetrograph

Another penetrometer is the mechanical self-recording penetrograph. This provides an immediate graphical display of the resistances as they are measured.



Laboratory research into physical soil characteristics

A large proportion of the equipment supplied by Eijkelkamp consists of (laboratory) equipment used to study physical soil characteristics. Below is a selection of the products on offer.

Permeameter

The planning and execution of hydrological and soil projects is more or less always preceded by geohydrological research. The permeability to water and air of the soil determines to a large degree how efficiently an irrigation or drainage system functions. The saturated water permeability (both horizontally and vertically) can be determined in both the field and in the laboratory using a permeameter for soil water. When using soil-water permeameters for laboratories, use is made of undisturbed soil samples taken in soil sample rings. See also page 3.

Applications:

The permeameter for soil water is used to measure the saturated permeability of undisturbed soil samples in sample rings. The permeability factor (K-factor) gives accurate information about: the presence of disruptive soil strata, the correlation between the permeability and other soil characteristics and the vertical and horizontal permeability. From these data, far-reaching conclusions can be derived with respect to:

- Irrigation and drainage systems
- Well pumps
- Soil subsidence
- Predictions concerning the spread of contaminated liquids resulting from major incidents.
- Soil improvement and maintenance recommendations.

Sand box for pF determination

The pF curve must be determined when studying the amount of water in the soil that is available for plants and trees. Dependent on the desired measurement range, use is made of under pressure (sand boxes) or overpressure (membrane apparatus). A maximum of 40 soil samples can be placed on the sand box. The samples that are measured are taken using soil sample rings.

Applications:

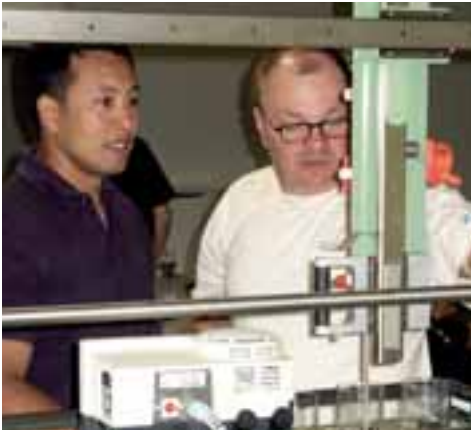
- Agricultural research
- Irrigation research
- pF determination

Properties:

Measurement range:	pF 0 - 2.0
Type of sample:	Undisturbed
Measurement accuracy:	0.0001 bar.
Number of samples:	Maximum 40
Weight of kit :	90 kg

Pipette apparatus

The pipette method is based on the difference in settling rates between large and small soil particles. The particles settle as the result of two opposing forces, namely gravity and the friction resulting from movement in a liquid medium. The pipette method uses a pipette to take samples at various times and depths from a suspension of the sample in a measuring cylinder. The times and depths are determined using Stokes law. The liquid is evaporated from samples taken from the suspension after which they are dried and then weighed to determine the percentage mass.



Applications:

- Aggregate stability
- Agricultural research
- Drainage research
- Erosion research
- Geotechnical research
- Granular composition or particle size distribution
- Remediation research

Properties:

Measurement range: < 38 microns
 Type of sample: Disturbed
 Measurement accuracy: +/- 1 ml
 Number of samples: 7
 Weight: 70 kg

**Wet sieve method**

The wet stability composition is determined using the principle that unstable particles, when these come in contact with water, settle easier than stable particles. To determine the stability, eight sieves are filled with selected soil particles. These sieves are placed for a time in water-filled containers and move up and down. The unstable particles separate from the stable particles, fall through the sieve and are collected in the water-filled container under the sieve.

Applications:

- Aggregate stability
- Agricultural research
- Erosion research

Properties:

Measurement range: < 2.0 mm
 Type of sample: Disturbed
 Number of samples: 8
 Weight: 9 kg

BENEFITS**Wet sieve method**

- Determines erosion sensitivity
- Based on simple undisturbed samples
- Sieves grain sizes from 1.00 to 2.00 mm
- Grains measuring 1.00 to 2.00 mm are shaken with water
- The grains which disintegrate are measured
- Pre-programmed grain washing time
- Universal 100-240 electrical plug

**Calcimeter**

The carbonate content of the soil has a large effect on soil fertility. To determine the carbonate content, Eijkelkamp – together with various Dutch research institutes – has developed a calcimeter.

This calcimeter makes use of the Scheibler method. In this method, the carbonate content of five soil samples is determined simultaneously using the volumetric method. The carbonate in a soil sample is converted into O₂. Because of the pressure of the released CO₂, the water level rises in one of the level tubes that are isolated from the outside air. The level difference is a measure of the amount of O₂ released. This can be converted into the carbonate content. Approximately one hour is required for each reaction. The required amount of sample is determined in advance by adding hydrochloric acid to the sample on a clock glass. The carbonate content is estimated based on how long the sample continues to effervesce. Based on this estimate, the amount of sample to be analysed is determined. By first making an estimate using pure Calcium carbonate, the water will be saturated with O₂, so that during the actual measurement, no O₂ is lost. This makes the measurement results more accurate.

Applications:

- Aggregate stability
- Agricultural research
- Chemical soil research
- Irrigation research

**BENEFITS****Calcimeter**

- Accurate measurements
- 5 bottles for group work
- Quick results
- Modern tools for every professional lab

Equipment for waterbed research

It is essentially important for laboratory research to have undisturbed waterbed samples available. Eijkelpomp has various instruments available in its programme for such work.

BENEFITS

Sediment sampler Beeker

- Samples never lost
- Close cutting shoe using air pressure
- Piston provides a perfect sample length
- For every sediment type
- For samples with a length of 150 cm maximum

'Beeker sediment sampler'

The 'Beeker sediment sampler' has for years been the best solution for taking undisturbed underwater sediment samples. The samples are taken in a transparent tube. The original stratification of the sediment is retained in the sample. This allows a clear profile description to be made.

The Beeker sediment sampler:

- Is suitable for different types of sediment
- Allows the simple removal of the sample by pushing on the piston rod or the dividing up of the sample using the hydropneumatic emptying and dividing system
- Is suitable as standard for use in water to a maximum depth of five metres

Properties:

Max. sampling depth : 5 meter

Max. sample length

and volume : 1.2 - 3.6 l

Type of sample: Undisturbed

Weight of set : max. 100 kg

Suitable for : sediment research in still or gently flowing water (max. 5 km/h)

Van Veen grabs

Indicative sampling of waterbeds, if required at great depths, occurs using cable-operated samplers. The stainless steel Veen grabs are used to take disturbed samples of among other places the beds of lakes and rivers. Various versions are available. The two smallest versions can be operated by hand. The larger are lifted and lowered on deck using a crane. To take a sample, the jaws are opened and held in position using a pawl. The Van Veen grab is then lowered slowly. The jaws contain holes that allow the air to escape as the grab is lowered. As soon as the jaws touch the bottom, the cable relaxes and the pawl is unblocked. When the cable is re-tensioned, the jaws close and the Van Veen sampler is retrieved.

Properties:

Maximum sampling depth : > 30 meter

Sample volume: 0.5 - 12.0 l

Type of sample: Disturbed

Weights: 2-41 kg (4 sizes)

Suitable for: Medium hard sediment, describing top profiles. Not for use in flowing water (max. 1 km/h)

BENEFITS

Van Veen grab

- Quickest indication of sediment type
- Four types, for every application
- Inert stainless steel construction

Multisampler

The multisampler is multifunctional. It can be used to take samples from badly contaminated water (for instance the liquid in a sewer). If the supplied ball valve is replaced by an open corer, undisturbed column samples can be taken from waterbeds, sand collectors, settling beds, crystallisation basins, etc. The sampling tube is transparent, allowing the sampling and the sample to be immediately visually assessed. The integrated piston prevents to a large degree the compression of the sample and in many cases prevents the sample from falling out of the tube. The materials used allow the device to be used in watery chemicals. It is possible to take both column and point samples in liquids. The multisampler provides excellent one-metre long profile descriptions from waterbeds, that is of course if it can penetrate one metre. A sample can be transported in the sampling tube or transferred to a sample jar or bucket.

Properties:

Maximum sampling depth: 5 meter

Sample volume: 1.00 l

Type of sample: Undisturbed (fluids semi-disturbed)

Suitable for: Soft sediment, profile descriptions in soft sediment to non compacted sand, for stationary and slowly flowing water (max. 3 km/h)

BENEFITS

Multisampler

- For sediment sampling on a low budget
- Professional tools with a transparent tube
- Open cutting shoe for undisturbed samples
- Ball valve for sampling in drains, basins, etc.
- Piston ensures perfect sample length



Groundwater sampling

The peristaltic pump is an extremely reliable sampling device for liquids and gases and can be used under various field conditions. In a peristaltic pump, the pumped liquid or gas only comes in contact with the inside of a silicone rubber tube. Cross contamination can be prevented by replacing the tube before taking each sample.

Applications:

- Taking anaerobic samples
- Taking biological samples (can be sterilised)
- Well development
- Cleaning monitoring wells
- Inline filtration
- Taking open water samples
- Taking tank samples
- Taking samples from monitoring wells
- Chemical research
- Taking samples of volatile substances
- Taking samples for metal detection

BENEFITS

Flow-through cell

- Makes pH/EGV/O₂/Redox measurements simple
- Works with practically all electrodes
- The principle makes 0% O₂ measurements possible
- Simple to clean, sand is not a problem
- Simplicity and durability in field work



Which peristaltic pump should you choose?

Eijkelkamp offers two types of peristaltic pump, with the new version being a cheaper alternative. In addition to the many similarities and advantages, there are a number of important differences that make the price difference between the trusted STANDARD type and the cheaper COMPACT version possible:

Peristaltic pump STANDARD

- Left- and right-hand rotation
- Memory for pump and sampling speeds
- Connection for two 12V pumps
- Internal and external battery supply

Peristaltic pump COMPACT

- Only right-hand rotation
- No speed memory
- No external pump connection
- Only internal battery supply

Should you choose for tried and tested certainty and a maximum range of applications, or should you choose a simple but functional pump? If you want the trusted opportunities and certainty then choose the "STANDARD" version. But it may of course be the case that you will take samples less frequently and are happy to accept less functionality. Maybe you will for instance never need an external power supply, because the built-in 4.5-hour power supply is more than enough for your needs. Or maybe you think you will not take samples with small submersible pumps. Then choose the 'COMPACT' version with a clear conscience.

Disposable filters for in-line filtration

Two disposable filters for the filtration of groundwater samples are available, one with limited capacity and one with a very high capacity. The small filter has an effective filter surface of 20 cm² and is suitable for filtering a limited volume of groundwater containing not too many fine particles. The large filter has an effective filter surface of 700 cm² (35 x the capacity of the small filter). Due to this high capacity, exchanging clogged filters can be dispensed with and filtering takes less time. Both filters have a pore size of 0.45 micron, a maximum allowable pressure of 4.4 kg/cm and a maximum peak pressure of 7 kg/cm. A tube with an internal diameter of 6-12 mm can be slid onto the inlet or outlet (for the large filter only 10 mm internal). The highest efficiency is achieved when a filter is connected to the pressure side of a peristaltic pump, set to a low speed.

Flow-through cell

The flow-through cell is intended to improve the ease and precision of in-line measurements of pH, EGV, T, O₂, etc.

Field meters

Eijkelkamp has various (multi-)meters and accessories in its product range. These CE-certified instruments have been specially developed for analytical measurements under demanding field conditions or in a laboratory environment.



e-SENSE and e+ SENSORS

Measuring with and managing of equipment remotely (from a considerable distance) is happening more and more. Setting, reading out and if necessary taking action from a location of choice are options that are nowadays standard requirements. Using the e-SENSE® telemetry measurement system, in which measurement data are collected by intelligent sensors such as the e+®-sensors or the Diver®, you do a lot more than just measure. Intelligent sensors independently take measurements in the field and store them internally. Via the connection to the e-SENSE field modem, your measurement data or alarm signals are then sent to a database running on your own PC (e-SENSE direct).

e-SENSE direct Open Interface as an option

Because a modern standardised SQL database system is used, e-SENSE direct has an Open Interface that ensures that the system can be easily and economically (using standard components) linked to other software systems such as SCADA.

e-SENSE direct

e-SENSE direct is easy to install (plug & play), to manage and to maintain. Using e-SENSE direct, you manage and communicate with your sensors from your PC. You have insight into the entire system and can change all of the settings. This allows you to let the system function optimally with respect to response time, the cost of data traffic and the use of the batteries. In addition, you can export the data to your own personal database.

Sending data via SMS

The decision has been made to use the GSM/SMS network. The reason for this is that the GSM network now has a virtually world-wide range. Data communication by SMS is relatively cheap and it is expected that the prices will come down still further in the near future. This distinguishes this system from other commonly used systems.

e-SENSE system

Set-up consisting of 7 basic equipments:

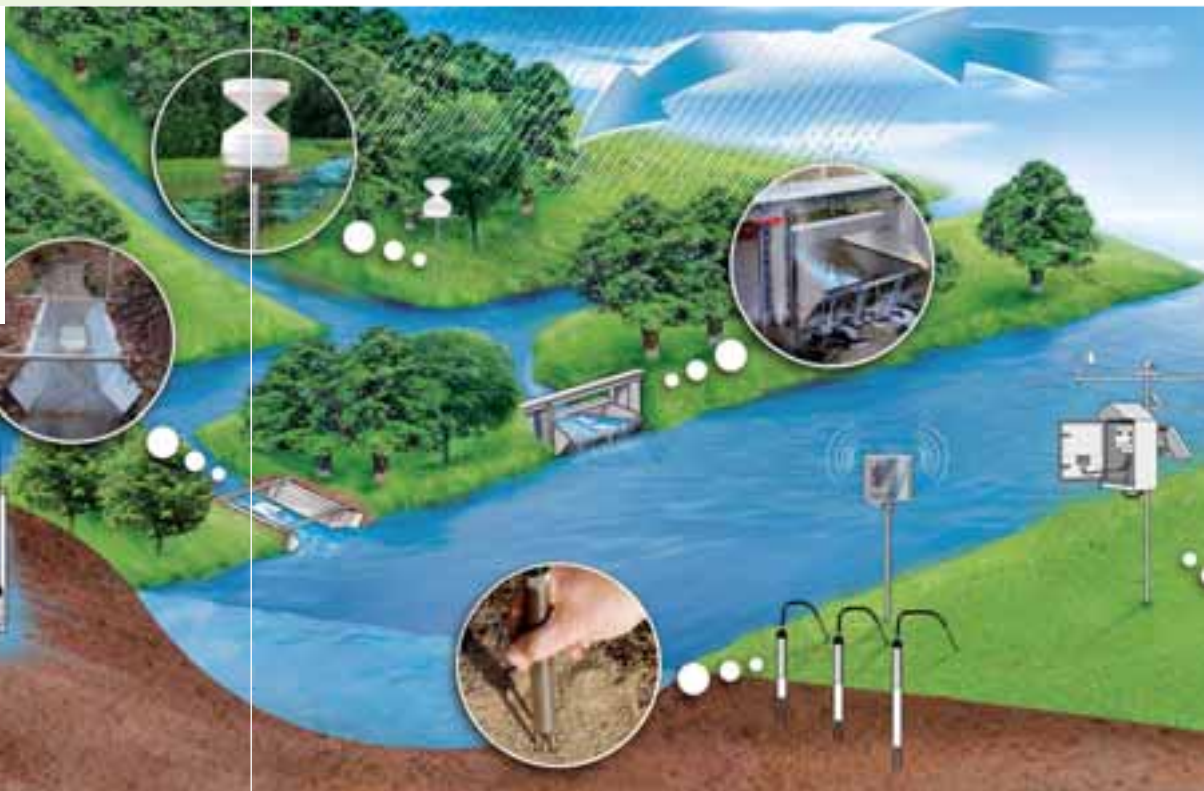
1. PC Modem set
2. Field modem: Standard or long life, 2 or 8 ports
3. Housing for field modem, underground or above ground installation
4. e+ Sensors: e+ SOIL MCT, e+ RAIN, e+ WATER L, e+ OVERFLOW and Diver sensors
5. Cables to connect the sensors to the field modem
6. Display unit for programming the sensors
7. Optional accessories

e-SENSE®

BENEFITS

e+ WATER L

- Everything in one water level logger
- Available up to 2 m in length
- No influence of air pressure
- Clever air opening, no problem with flooding
- To be read out on the spot, on site or on the office PC
- Ideal for canals, lakes, shallow wells



Field modem

The field modems are available in four different types: 1 with 2 ports and 1 with 8 ports, both of which may be combined with or without extended-life batteries. The field modem is an SMS modem to which 2 or 8 sensors (e+ sensors or Divers) at most can be connected.

Installation in the field, 'plug and play'

The e-SENSE field modem is fitted with a display that shows the status during the installation process.

Housing

You have the choice between an underground or above ground housing.

The sensors

The e-SENSE modem is ready for use. The sensors that can be connected to it include:



A. e+ SOIL MCT-sensors

The e+ SOIL MCT sensor / logger measures soil moisture content, conductivity and temperature.

e+ SOIL MCT-logger:

- Memory capacity: 3 x 20,000 readings
- Measurement interval: 10 - 60 seconds; 1 - 60 minutes; 1 - 24 hours
- Data log method: fixed interval times
- Clock accuracy: 1 second a day
- Alarm levels (can be set): low and/or high alarm in the full range of all parameters
- Battery level indication: 0 - 100 %

e+ SOIL MCT-sensor:

- Measurement frequency: 20 MHz
- Measurement volume (saturation): 1000 ml (at 500 ml an accuracy of 98 %)
- Soil moisture measurement range: 0 - 100 volume %
- Soil moisture accuracy: +/- 2.5 % of the measured value (mineral soils, 0 - 50 °C)
- Soil moisture resolution: 0.01 %
- Conductivity measurement range: 0 - 5 mS/cm
- Conductivity accuracy: +/- 5 % of the measured value (at 0 - 50 °C, 0 - 2 mS/cm)
- Conductivity resolution: 0.01 mS/cm
- Temperature measurement range: 0 - 80 °C
- Temperature accuracy: +/- 0.5 °C
- Temperature resolution: 0.01 °C



BENEFITS

e+ SOIL MCT

- Follows changes in the soil moisture level
- Records conductivity and temperature
- Large memory, details can be sent by modem
- Uploading in-situ in the field with the help of infrared communication
- Different lengths available for profile research
- Perfect for analysing trends

B. e+ RAIN-sensors

The e+ RAIN sensors measure the intensity of rainfall over certain periods, but they also record the total quantity (integration function).

e+ RAIN logger:

- Number of channels: 2
- Memory capacity: 2 x 30,000 readings
- Measurement interval: 10 - 60 seconds, 1 - 60 minutes, 1 - 24 hours
- Data log method: fixed interval times
- Clock accuracy: 1 second a day
- Alarm levels (can be set): low and/or high alarm in the full range of all parameters
- Battery level indication: 0 - 100 %
- Precipitation intensity range: 0 - 100 mm per measurement interval
- Precipitation integrator range: 0 - 500 mm per measurement interval

e+ RAIN-meter, synthetic:

- Type: tipping bucket
- Accuracy: 1 %
- Resolution: 0.2 mm
- Measuring surface: 507 cm²
- Height: 340 mm
- Diameter: 254 mm
- Weight: ±1.15 kg

e+ RAIN-meter, metal:

- Type: tipping bucket
- Accuracy: 2 %
- Resolution: 0.2 mm
- Measuring surface: 400 cm²
- Height: 420 mm
- Diameter: 284 mm
- Weight: ±8.4 kg





C. e+ WATER L-sensors for surface water

The e+WATER L-(level) sensor is an intelligent and accurate sensor for measuring and recording the level and temperature of surface water.

e+ WATER L-sensor:

- Level measuring range: dependent on the type water column of 0 - 50, 0 - 100, 0 - 150 and 0 - 200 cm
- Level accuracy: +/- 0.5 cm
- Level resolution: 0.1 cm
- Temperature measuring range: -20 to +80 degr.
- Temperature accuracy: +/- 0.5 °C
- Temperature resolution: 0.01 °C

e+ WATER L-logger:

- Number of channels: 2
- Memory capacity: 2 x 30,000 readings
- Measurement interval: 1 - 60 seconds; 1 - 60 minutes; 1 - 24 hours
- Clock accuracy: 1 second a day
- Alarm functions: low and high alarm throughout the entire range of all parameters
- Battery level indication: 0 - 100 %

The e+ WATER L-sensors can also be fitted with a robust and functional stainless steel installation system.



D. e+ OVERFLOW

Normally speaking, rain and waste water are transported to the treatment plant via the sewer system. However, during heavy rain or in other situations, the capacity of the sewers may be insufficient. If this is the case, some of the water in the sewers flows via overflows into the surface water. This can result in problems. To have a sewer overflow requires Dutch local authorities to obtain a 'Wvo permit' (Discharge of household waste water). The manager therefore needs to know if an overflow occurs and for how long. The e+ OVERFLOW is an intelligent and accurate sensor for measuring and recording sewer overflows (how often and for how long does an overflow occur). The level measurement values are automatically compensated internally for air pressure and water density variations as a result of temperature. The instrument is installed at the overflow wall in the sewer.

e+ OVERFLOW:

Instrument diameter	: 50 mm and 22 mm
Instrument length	: type dependent (from 856 to 185 cm)
Instrument weight	: type dependent (from 1.0 to 2.2 kg)
Working temperature range	: -20 ...+80 °C
Working moisture range	: 0...100%
Housing	: stainless steel 316L

e+ OVERFLOW sensor:

Level measurement range	: Type dependent from 70 through 170 cm watercolumn
Level accuracy	: +/- 0.5 cm
Level resolution	: 0.1 cm
Max. water column above water seal	: 5 cm

Power supply:

Battery	: 3.6 V / 2.3 Ah Lithium (interchangeable)
Battery life	: 5 years (measurement interval 10 min.)

e+ OVERFLOW Logger:

Number of channels	: 1
Storage capacity	: 40,000 readings
Measurement interval	: 10...60 seconds 1...60 minutes 1...24 hours
Recording delay	: 1...999
Clock accuracy	: <1 sec. per day
Battery status (indicator)	: 0 - 100 %

Communication

Via	: Readout cable (DDC - USB)
Software	: Logger Data Manager



E. Diver sensors for groundwater

All members of the Diver family can be used in the e-SENSE system. See also page 16.



Monitoring well pipes and accessories

In various forms of soil research, many monitoring wells pipes are installed. Eijkelkamp has a wide range of monitoring well pipes. Monitoring wells are used among other things to determine the rise of groundwater, but also for taking ground water samples for research into soil contamination. Eijkelkamp's monitoring well pipes are made from materials, such as HDPE or PVC, that do not contaminate the water samples.

Quality monitoring well pipe

The quality filter is already equipped with filter sand and filter gauze. Normal plain pipes or bentonite collars can be screwed to the filter. These are one-metre long plain pipes around which high-quality collars of bentonite are securely fitted. The term 'quality well pipe' actually means what it says: no more fussing with loose filter sand and no longer bentonite that becomes lodged halfway in the bore hole or that is extracted with the casing.

Bentonite

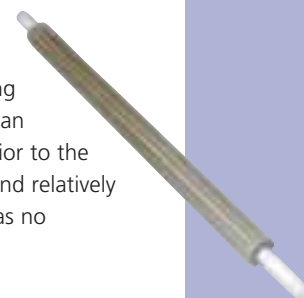
When making a bore hole, often to install a monitoring well, impervious strata are often drilled through. If the sealing operation of such a stratum is not repaired, contamination can easily spread into a water-bearing stratum that was clean prior to the hole being drilled. Here, bentonite can be used as a cheap and relatively simple seal. Due to its natural, slightly adsorbent nature it has no appreciable effect on the water composition.

Multi Channel Well

To make vertical groundwater profiles or 3D profiles, multiple filters must be installed at various depths at the same location. One large bore hole containing a number of pipes with a filter section in each pipe is a possibility. Due to the incorrect installation of filter sand and bentonite or the settling of the filter sand or bentonite, it can be the case that incorrect strata are sampled, so that the filters become clogged and there is an undesired flow in the bore hole or even that contaminants are spread. The use of a multi channel well solves the problem described above.

The principle of the multi channel well

The central pipe of the multi channel well receives water from the lowest prefabricated filter. Using special equipment, a maximum of six ports can be opened on the side of each channel at higher levels. BentoBlocks that swell outwards, sand-bentonite collectors and prefabricated filters that are easily slid into position make it possible to very quickly make a multi-level filter (1 hour to assemble a complete seven-channel well and an additional 20 minutes to sink it). The result is a multi-level filter that contains filter openings at strategic heights and that are separated from each other by the collectors and the bentonite.



Your partner in knowledge and skills

The importance of Capacity Building lies in the fact that for a successful project it is insufficient to just supply good equipment. The ability to provide good training with this equipment is also very important. This is something that Eijkelkamp clearly wants to illustrate with its attention for Capacity Building.



Importance of training

Know what you measure! Training ensures that people become motivated to use the Eijkelkamp products. As a result, measurement errors will be prevented, which is an even greater advantage. Handling the equipment correctly will result in reliable data, which will improve the ability to draw the right conclusions. Moreover, training can form an important part of a quality system.

Training structure

The training given by Eijkelkamp Training & Consultancy consists of theory about the field of research concerned, which provides insight into the background, norms and standards that are used. This theoretical section is followed by an explanation of the manner in which the research is approached in practice. This part consists of preparation, transport, standardisation and a selection of the equipment to use. Finally, the equipment is used in practice, generally using the manual as the starting position.

Our training courses address the following areas:

1. Environmental soil research
2. Soil research
3. Water management

Location

Eijkelkamp Training & Consultancy has its own training location with a canteen, showroom and covered demonstration area in Giesbeek. Every year, hundreds of students from both the Netherlands and abroad receive training in handling Eijkelkamp equipment. Moreover, Eijkelkamp Training & Consultancy provides in-company training on location in the Netherlands or abroad.



Recent project: Long life learning in Tashkent!

Last summer, Jan Frank Mars of Eijkelpkamp Training & Consultancy gave a training course, as part of the Tempus Team project in Uzbekistan, to a group of 15 trainees. The participants were all responsible for the quality of the environment in Uzbekistan.

The primary objective of this project is to teach people how to use techniques in the area of environmental checks of ground and surface water, soil quality and waste flows. What was remarkable about this training was that the environmental problems are mainly to be found in the agricultural sector. Issues to be considered here include the illegal dumping of waste, the use of too many pesticides, salinisation of the soil and excessive fertilisation of the soil. Here, the soil itself and the properties of the relevant soil play an important role, as well as the processes taking place in the soil.

Contents

Knowing what you measure, why you are measuring it and how you can measure it are the most important aspects of the training. The participants gained insight into the placement of monitoring wells, taking groundwater samples and determining the most important parameters. The training also covered soil classification, whereby important qualities of the soil, such as its ability to hold moisture, adsorption and absorptive power, were charted. Furthermore, much attention was given during the training to the taking of good mixed samples for laboratory analysis. Since the suction tension of the soil plays an important role, learning to make good pF curves made up the final part of the training. For this, a pF box (sand and kaolin) and the pF extractor were installed together with the participants. The participants, together with Jan Frank Mars, then made a pF curve from a soil sample.

For the first time during an Eijkelpkamp training, use was made of video conferencing. This means that Jan Frank was filmed during the whole training. The PowerPoint presentation of the training was synchronised with this, and it was immediately translated into Uzbek. The great advantage of this is that people who did not take part in the training can still follow the training!

Other projects:

Eijkelpkamp Training & Consultancy is involved in many other projects. Here are some examples:

- Tempus projects in Russia and Uzbekistan
- Unesco-IHE in Ghana
- Nuffic project
- Senter project in Romania



Measuring and recording the groundwater level

We cannot live without water. It is a well-worn expression, even so no less true. To make full use of all of the possibilities offered by water, water management is required. It is of fundamental importance to regularly take reliable groundwater measurements. The Diver is the ideal instrument for this!

Diver dataloggers for groundwater

The Diver is the smallest instrument in the world for automatically measuring and recording groundwater levels and groundwater temperatures; the CTD-Diver also measures conductivity. With a length of just 90 mm (183 mm for the CTD-Diver) and a diameter of 22 mm (18 mm for the MicroDiver), the Diver can be used in more or less every monitoring well. The pressure sensor, temperature sensor and conductivity sensor are housed together with the datalogger and the battery in a hermetically sealed stainless steel or ceramic housing. This makes the Diver less sensitive to moisture or external electrical influences (the Faraday cage effect). The Diver can automatically measure the groundwater level and the groundwater temperature and record the measurements in its internal memory. The built-in battery has a life of approximately 8-10 years. It takes just seconds to program the Diver, whether this is done in the field or in advance in the office.

Versions:

The Diver is available in various versions:

The **MiniDiver**[®]: stainless steel housing and a ceramic pressure sensor, diameter 22 mm, length 90 mm, available with various measurement ranges, memory capacity for 24,000 readings.

The **MicroDiver**[®]: stainless steel housing and a ceramic pressure sensor, diameter 18 mm, length 90 mm, available with various measurement ranges, memory capacity for 48,000 readings.

The **CeraDiver**[®]: a ceramic housing, a ceramic pressure sensor, diameter 22 mm, length 90 mm, available for various measurement ranges, memory capacity for 48,000 readings.



The **CTD-Diver** has a ceramic housing, a ceramic pressure sensor and a platinum/ ceramic conductivity sensor (measurement range 0 - 80 mS/cm), a diameter of 22 mm, a length of 183 mm, is available in various measurement ranges and has a memory capacity for 16,000 readings.

Groundwater quality

Frequently monitoring the groundwater quality by hand is exceptionally labour intensive. This also applies to detecting salinity, salt water intrusion or contamination at soil remediation projects and around landfill sites. The CTD-Diver in a ceramic housing is the latest standard for robustness and reliability. The ceramic housing and the unequalled measurement range for conductivity (0-80 mS/cm) allow this CTD-Diver to be used at every monitoring location.

Ceramic

Even the most corrosive substances that are found in the water environment will not affect the ceramic CTD-Diver. Where even corrosion-resistant metals fail, the ceramic housing of this CTD-Diver survives.

The ceramic CTD-Diver is an extremely reliable, compact datalogger for measuring simultaneously the groundwater level, temperature and conductivity. These parameters are measured at a frequency determined in advance with the measurements then being stored internally in the memory. The measurement details can be read out at any desired moment.



The **Baro-Diver** is used to record the barometer level. The Logger Data Manager (LDM) software can be used to quickly and easily compensate for the variations in these measurements.

Guarantee and telemetry

Each member of the Diver family is covered by a three-year guarantee.

They can be used as an e+ sensor in the e-SENSE telemetry measurement system.

BENEFITS

Diver

- Everything in one clever water level datalogger
- No mechanical parts, no wear and tear
- No air opening, no problem with flooding
- 5-100 metres reach
- Read-outs using DDC cable
- To be combined with e-SENSE telemetry
- Software makes input and output of data simple
- Many output formats
- BaroDiver for air pressure variations
- Ideal for observation wells, also suitable for open water
- CTD calculates conductivity
- CTD is long-term resistant to salt water (ceramic)

COLOPHON

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