

# WIP-PROBES/MASTER

## Technical specifications



WIP-Probes	
<b>Length, diameter</b>	130 mm, aØ 12 mm
<b>Measuring method</b>	Direct Vapor Equilibrium method — Dilution Diffusion Sampling (DVE — DDS)
<b>FILTER CARTRIDGE</b>	
<b>Length, diameter</b>	56 mm, aØ 10 mm
<b>Material</b>	porous HDPE membrane head
<b>Pore size</b>	10 µm
<b>CONNECTING SLEEVES</b>	
<b>Material</b>	anodized aluminium
<b>3 X CAPILLARIES</b>	
<b>Diameter</b>	aØ 1.6 mm; iØ 0.75 mm
<b>Material</b>	Teflon (FEP)
<b>Usage</b>	for sample collection, rinsing and dilution
<b>PROTECTIVE TUBE</b>	
<b>Diameter</b>	aØ 8 mm
<b>Material</b>	PA
<b>COLOR CODED TERMINAL NUTS</b>	
<b>Size</b>	1/16, 1/4"-28 UNF
<b>Usage</b>	for direct connection to a WIP master 7+3 or WIP hub 10

WIP-Master	
<b>Dimensions</b>	50 x 21.1 x 54 cm
<b>Weight</b>	20 kg
<b>Protection class</b>	IP54 (splash-proof on all sides)
<b>Power supply</b>	230 V
<b>Ports</b>	10 Ports, standard for 6 WIPs/hubs, 3 isotope standards, 1 purge line
<b>Standards</b>	Regularly included in delivery: 3 WIPs for standard measurements (40 cm tube length), holder for max. 3 standards, 3 Duran glass bottles (250 ml) with adapter connection
<b>Software</b>	IsWISaS. Python-Script, for installation on Windows computers of the Picarro analyzer. User-friendly GUI shows the current measured values and flow rates

### Order information

#### WIP-Probe

Art.-No.: 1289095 (WIP, 5 m connection length)  
Art.-No.: 1289094 (WIP, 10 m connection length)  
Art.-No.: 1289093 (WIP, 15 m connection length)

#### WIP-Master

Art.-No.: 1289096 (WIP-Master)

#### WIP-Hub

Art.-No.: 1289097 (WIP-Hub)

#### WIP-Setup for EcoLabs

Art.-No.: 1880130 (WIP-Setup for EcoLabs)

#### Picarro L2140-i Analyzer

Art.-No.: 5070108



## Water Isotope Probe WIP-SYSTEM

Investigation of the whole soil-plant-water cycle

Direct, non-destructive in-situ measurement

Continuous, temporally high-resolution Isotope  
measurements





# WATER ISOTOPE PROBE-SYSTEM

## Diffusion Dillution Sampling

Water Isotope Probes (WIPs) are used for the direct, non-destructive in-situ measurement of the stable water isotopes  $d^{18}O$  and  $d^2H$ . They work according to the „Diffusion Dillution Sampling“ method (DDS, Volkman and Weiler 2014) based on the equilibrium between gas and liquid phases (Direct Vapor Equilibrium Methode DVE).

In the DVE-DDS method, no absolute pressure gradient is established, but the equilibrium is set by diffusion, using the different water vapor partial pressure in the gas mixture in the filter cartridge and the surrounding medium (soil / snow / xylem / air). This has the advantage that the WIPs can also be used under saturated

conditions. However, the water inlet pressure of the filter cartridge used must not be exceeded, for example, by a water overflow.

### UGT with exclusive license

The probes were developed at the University of Freiburg and are based on the scientific findings of Volkman and Weiler (2014) (patent no. (patent no. DE102013013969B3). Since 2022 have been continuously optimizing them, producing them under exclusive license and distribute them. To date, the WIPs are the only in situ probes proven to work in soil and tree xylem (Volkman et al. 2016 in Seeger and Weiler 2021).

### Design and function of the WIPs

The WIPs consist of three parts:

- 1) Filter cartridge
- 2) shaft with mixing chamber
- 3) Protective tubing, which guides three gas transport capillaries in a defined geometry into the insertion shaft and into the filter cartridge.

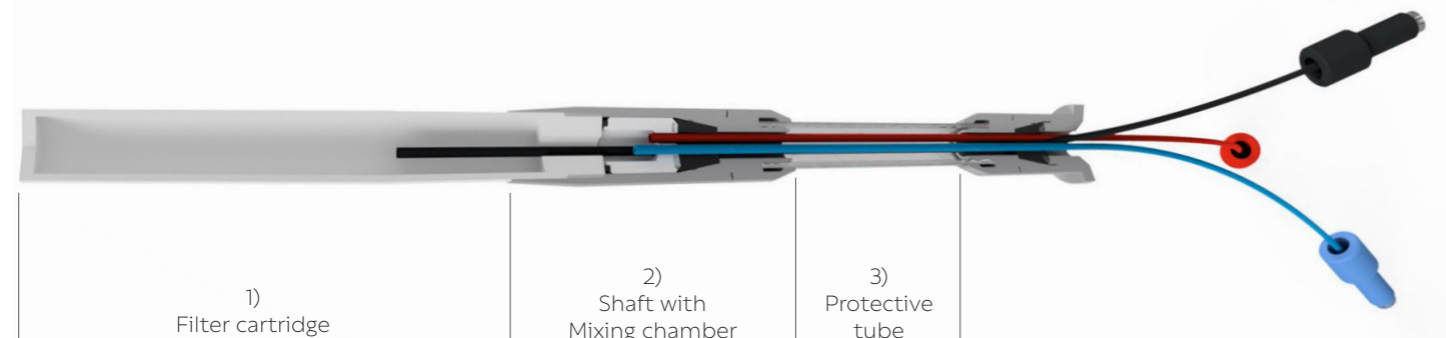
Water vapor diffuses from the surrounding medium into the mixing chamber via the filter cartridge.

The sampling capillary guides the gas flow from the probe to the isotope laser spectrometer. A second

capillary supplies controlled nitrogen for dilution of the the sample gas into the mixing chamber. In this way, a relatively stable water vapor concentration of the sample gas can be ensured. The third capillary extends into the filter cartridge. It supplies just enough nitrogen during measurement to ensure pressure equalization and provides purging between measurement cycles.

The advantages of the dilution principle of WIPs vs. the advantages of the dilution principle of the WIPs over comparable probes are the relatively stable concentration and the very small line diameters. line diameters. Condensation and thus fractionation is largely prevented, which also protects the measuring chamber of the isotope analyzer.

Installation is easy and the same probes can be used for all media (soil / tree / air).



Cross section WIP © UGT GmbH

## Optimum measuring success with our WIP system

To set up our WIP system perfectly, you need, in addition to the WIP probes:

- ✓ a WIP-Master with special software
- ✓ a Picarro water isotope analyzer with monitor and external pump
- ✓ a dry gas source
- ✓ if necessary, a distribution box (WIP-Hub) with connection string

For the setup of a WIP system in our EcoLab flex we offer the WIP setup for EcoLabs.

