



Manual

iMetos ECO D2

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1 The iMETOS eco d2

Thank you for choosing an iMETOS for monitoring soil moisture or environmental data. The iMETOS eco d2 is created to monitor data with limited sensor sets. Like all products of the iMETOS familie it measures, logs and sends the data to the internet. iMETOS eco d2 systems will be mainly used for:

- Soil Moisture Monitoring with Decagon ECH₂O sensors, watermark sensors or tensiometers.
- Rain and water level monitoring with rain gauges and pressure transducers.

1.1 iMETOS eco d2 for soil moisture monitoring

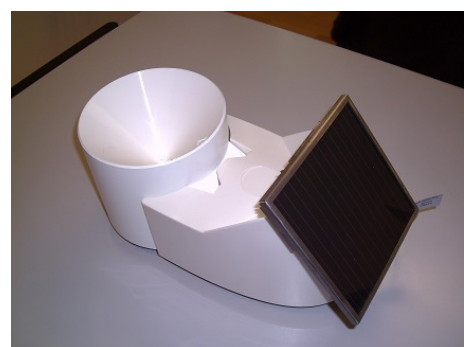
If your iMETOS eco d2 was intended for soil moisture monitoring it comes in minimum with a set of soil moisture sensors connected to the main unit. The sensors connected to it can be EC 5, HS10, 5TE from Decagon Limited and/or Watermark sensors or tensiometers form Irrrometer.

This sensors can be connected to the iMETOS eco d2 itself or - of it is needed because of the installation or because of the number of sensors – they can be connected to an extension box on a serial bus connection.



1.2 iMETOS eco d2 for rain monitoring

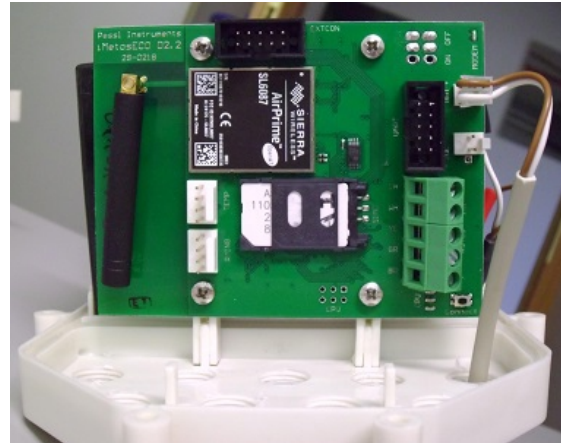
If your iMetos eco d2 is intended for rain monitoring it will have a rain gauge connected to its main body. Beside of this it can be equipped with sensors for soil moisture monitoring, for soil temperature monitoring or for water level monitoring. The sensors for soil moisture monitoring can be connected directly to the iMETOS eco d2 or can be connected to extension boxes like in the system described before.



2 Start-up the iMETOS

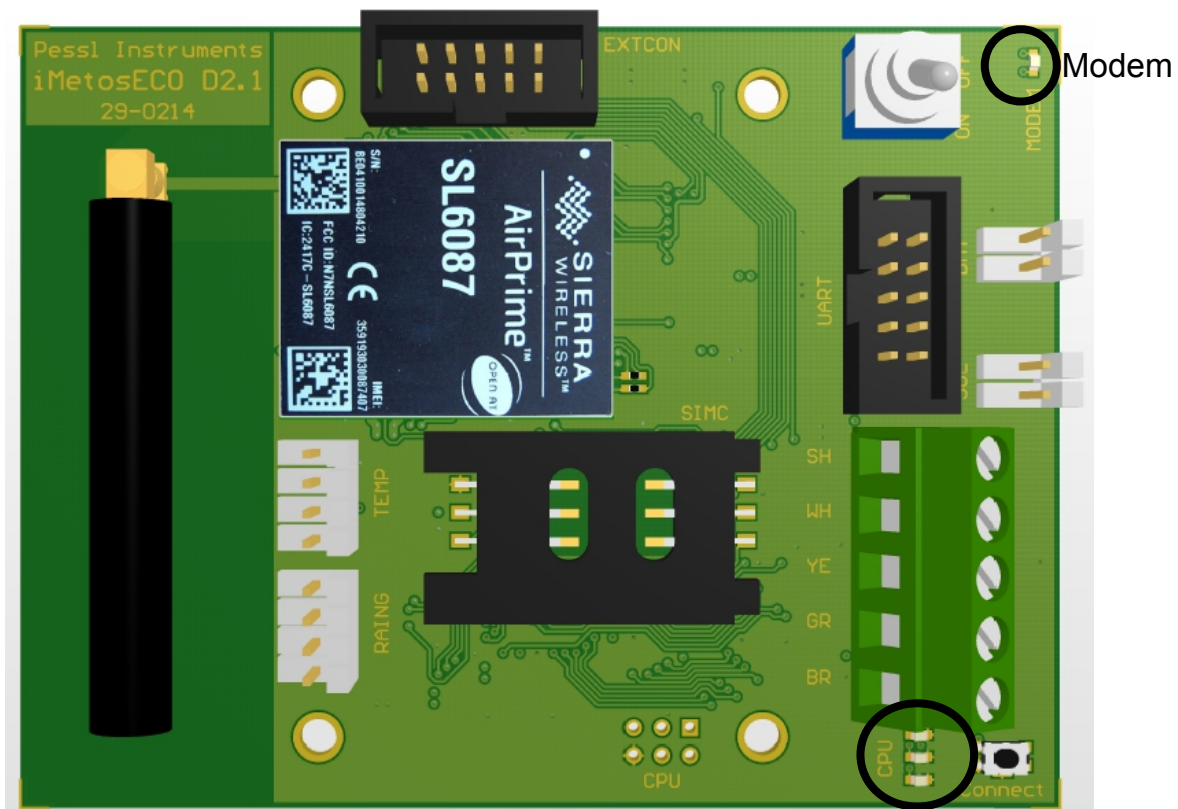
To start up the iMETOS you will need a valid GSM contract with the possibility to send at least 5MB data on GPRS per month and with the ability to send and receive SMS-messages. This contract has to be activated up front. Please make sure that the PIN code of the SIM-card is deactivated. To deactivate it you will need a mobile phone of the same company.

The iMETOS housing is closed with 6 M3 screws. To open them you will need an Allen key of 2.5 mm. This is part of the delivery. When you opened it the lower part will be still hanging on the upper part due to the short connection of the battery. The battery has to be pulled out of the top with care. Do not use too much force for this. It might help to knock at the site of the top and pull softly. Please open the iMETOS and enter the SIM-card. If the system has been sent by any type of parcel service the power will be disconnected. Please connect the power after inserting the SIM card. Please check if the solar panel is connected as well.



If the power is connected press the little black bottom to initialise an internet connection. The success of this can be observed by a blinking code of the iMETOS LED and the modem PCB LED.

If the SIM card has been successfully inserted your iMETOS has registered in the internet and it will send data to the web server. To access this data use <http://www.fieldclimate.com>. All settings on data upload times time zone, position and much more can be set up on this web site. To use it you will have to register as a user first.



iMETOS

To close the iMETOS again it will need to enter the battery again and to fit the top on the button part. If all fits together insert the 6 screws and tighten them carefully.

Blinking code

- **Connect to power:** iMETOS LED short on - long off blinking, wait for modem
- **GSM connecting:** GSM LED short on - long off, iMETOS LED short on – short on – long off
- **TCP/IP connected:** GSM LED short on – long off, iMETOS LED short on – short on – short on – long off
- **Data successfully send** iMETOS LED short on – short on – short on – short on – long off
- **Test not successful:** iMETOS LED stays on

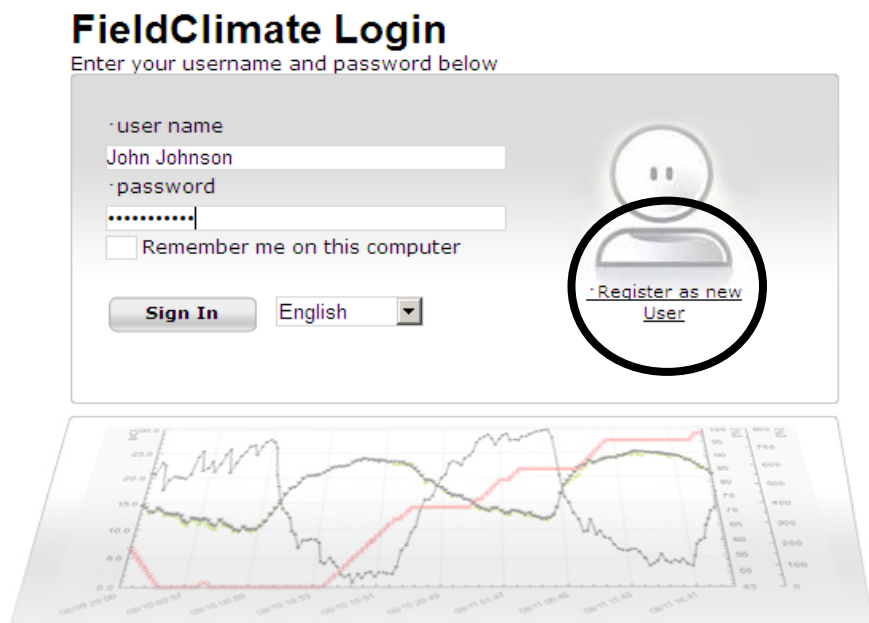
3 Use your iMETOS on [http:// fieldclimate.com](http://fieldclimate.com)

FieldClimate.Com is the web service you are intended to use your iMETOS with. It allows you to see the data in graphs or tables. It provides interfaces for automated downloads and it provides a powerful decision support system for plant protection and irrigation.

3.1 Register yourself as a user on FieldClimate.Com

To use the services on FieldClimate.Com it is needed to register as a user for this. Please press the link with you see surrounded by the circle on the graph beside.

The registration screen which comes up now asks you for a username and a password and it needs your email address as well as your postal address and some information about the company. Please note you will have to enter the real email address. A acknowledge email is sent to your inbox and its containing link has to be used to activate the newly created user account on FieldClimate.Com.



FieldClimate Login
Enter your username and password below

· user name
John Johnson

· password
.....

☐ Remember me on this computer

English ▾

[Register as new User](#)

The image shows a login form with fields for username and password, a 'Remember me' checkbox, a 'Sign In' button, a language dropdown set to 'English', and a link to 'Register as new User' which is circled in black. Below the login form is a preview of a data graph showing multiple lines over time.

3.2 Add the iMETOS to your account

If you have got the activation email and you activated the account you will be able to enter to FieldClimate.Com. Now the system welcomes you with the error message that there is no iMETOS connected to this new account. To change this press the “Add New Station” link.



The image shows the 'FieldClimate Account Settings' page. The top navigation bar includes links for 'Welcome, Heiner Denzler', 'Add new station' (circled in black), 'User settings', 'Log out', and 'Go to old'. Below the navigation bar are tabs for 'Stations', 'Favorites', and 'Apps'.

It will ask you for a serial number and a key. Now the little silver colored sticker which came with your iMEOS has to be used. This sticker contains two keys. Key 1 gives the power to change all the settings on the iMETOS whereas key 2 is only valid to use the data of the system. To be able to set up the



[Add a new Station](#)

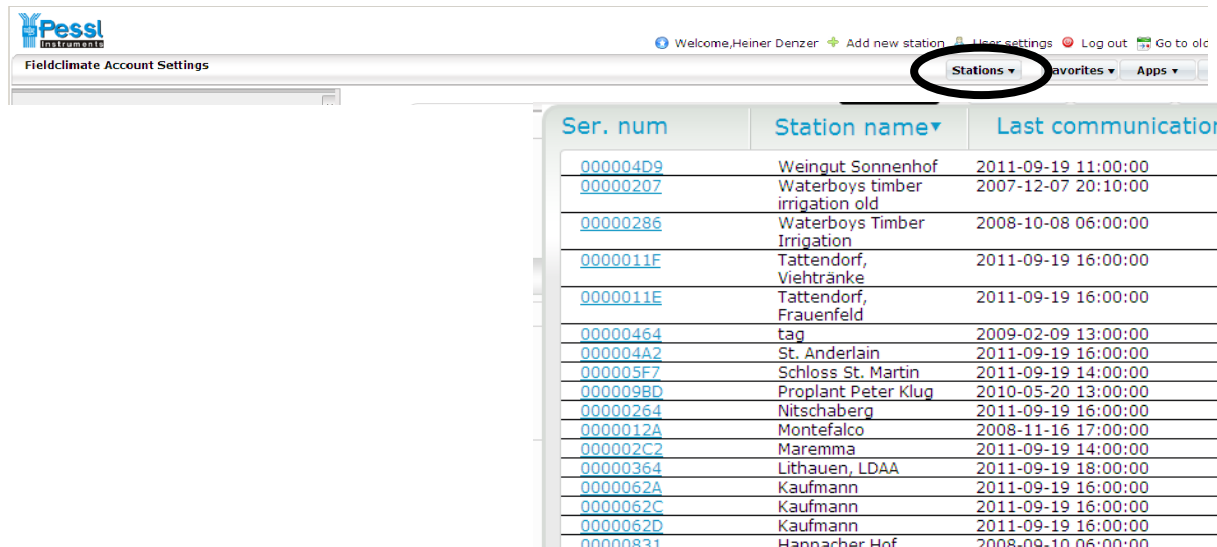
Information

· Serial No.

· Key

The image shows a form titled 'Add a new Station'. It has a section for 'Information' with two input fields: 'Serial No.' and 'Key'. Below these fields is a 'Submit' button.

iMETOS please enter the key 1 here. If you entered the correct key your station list will be enlarged by this iMETOS and it can be selected.



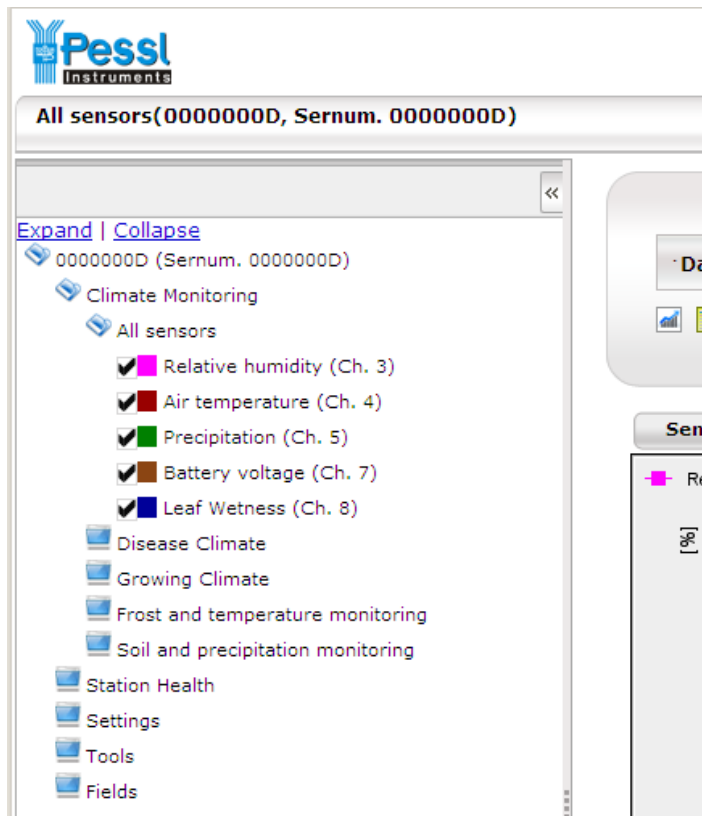
The screenshot shows the Pessl Instruments web interface. The 'Stations' menu is highlighted in the top navigation bar. Below it, a table lists various stations with their serial numbers, names, and last communication times.

Ser. num	Station name	Last communication
000004D9	Weingut Sonnenhof	2011-09-19 11:00:00
00000207	Waterboys timber	2007-12-07 20:10:00
00000286	Waterboys Timber	2008-10-08 06:00:00
0000011F	Irrigation old	
0000011E	Tattendorf, Viehtränke	2011-09-19 16:00:00
0000011E	Tattendorf, Frauenfeld	2011-09-19 16:00:00
00000464	tag	2009-02-09 13:00:00
000004A2	St. Anderlain	2011-09-19 16:00:00
000005F7	Schloss St. Martin	2011-09-19 14:00:00
000009BD	Proplant Peter Klug	2010-05-20 13:00:00
00000264	Nitschaberg	2011-09-19 16:00:00
0000012A	Montefalco	2008-11-16 17:00:00
000002C2	Maremma	2011-09-19 14:00:00
00000364	Lithauen, LDAA	2011-09-19 18:00:00
0000062A	Kaufmann	2011-09-19 16:00:00
0000062C	Kaufmann	2011-09-19 16:00:00
0000062D	Kaufmann	2011-09-19 16:00:00
nnnnnnR31	Hannacher Hof	2008-09-10 06:00:00

3.3 The iMETOS Menu

When you selected a iMETOS and the site has reloaded the menu visible on the left side of the screen is valid for the selected iMETOS. The menu starts with the given name and serial number of the station. Pessl Instruments tried to structure the menu following the frequency you will need the different entries. Therefore the menu starts with the links responsible for data presentation. It can be used to open graphs and tables of:

- **All sensors**
- **Disease related Climate sensors**
- **Plant Growing related Climate sensors**
- **Sensors for Frost and temperature monitoring**
- **Sensors for Soil and precipitation monitoring**



The screenshot shows the Pessl Instruments web interface with the 'All sensors' menu expanded for a specific station (Sernum. 0000000D). The menu is structured as follows:

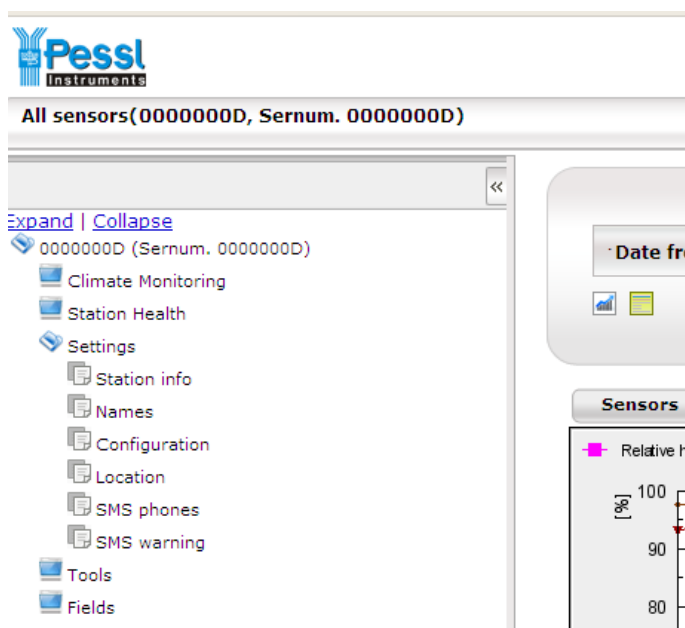
- Expand | Collapse
- 0000000D (Sernum. 0000000D)
 - Climate Monitoring
 - All sensors
 - ☒ Relative humidity (Ch. 3)
 - ☒ Air temperature (Ch. 4)
 - ☒ Precipitation (Ch. 5)
 - ☒ Battery voltage (Ch. 7)
 - ☒ Leaf Wetness (Ch. 8)
 - Disease Climate
 - Growing Climate
 - Frost and temperature monitoring
 - Soil and precipitation monitoring
 - Station Health
 - Settings
 - Tools
 - Fields

The menu entry “**Station Health**” shows battery voltage and solar panel voltage to inform about the charging situation. “**Settings**” are used to control the behaviour of the iMETOS in the field and in the internet. “**Tools**” contains a set of helpful functions for data presentation and data use.

3.4 Settings for your iMETOS

The settings menu starts with the link “**Station info**” which displays you information about the name, type and software of the iMETOS. It shows you the GPS position which has been set for this station. It lists the duration of the data recorded on FieldClimate.Com for this station. From this screen you will be able to look for the statistics of the internet connections done by the iMetos and some events logged by the device.

The link “**Names**” leads you to a screen where you can enter a given name for the station and for all sensors. The “**Configuration**” link lets you enter the logging interval, the time zone, the transmission times and an telephone number to which an emergency SMS is send on malfunction of the iMETOS. “**Location**” offers you a tool to enter the GPS position of the iMETOS by the use of maps or satellite pictures. The links “**SMS phones**” and “**SMS warning**” are needed to set up an alert system for frost or soil moisture.



3.5 Giving names to the iMETOS

Every iMETOS is significant named by a serial number. For the most users it is more convenient to name it after the site it is installed. Therefore the names screen offers the possibility to enter a given name.

Station name(0000000D, Sernum. 0000000D)

Station name: 0000000D

User defined station name:

Code	Chain	Channel	Sensor name	User defined Sensor name	Unit	
1	0	3	Relative humidity	Relative humidity	[%]	<input type="button" value="Ok"/>
0	0	4	Air temperature	Air temperature	[°C] <input type="button" value="v"/>	<input type="button" value="Ok"/>
6	0	5	Precipitation	Precipitation	[mm] <input type="button" value="v"/>	<input type="button" value="Ok"/>
7	0	7	Battery voltage	Battery voltage	[mV] <input type="button" value="v"/>	<input type="button" value="Ok"/>
4	0	8	Leaf Wetness	Leaf Wetness	[min] <input type="button" value="v"/>	<input type="button" value="Ok"/>

If you enter the name the “**update**” link has to be pressed to save this entry on the web server. In the sensors name menu the given name for the sensor can be entered and the colour for the sensor can be changed by clicking on the colour field. This settings have to be send to the web server by pressing the “**OK**” link in the specific line.

3.6 Setting the Configuration of a iMETOS

Users of a new iMETOS have to visit this link to select the time zone. If the time zone is not set the iMETOS will assume to be ion Greenwich time (GMT). The setting for logging interval and transmission times will work with the default values as long it is not changed.

Configuration(0000000D, Sernum. 0000000D)

Name	0000000D																								
User defined name	0000000D																								
Logging interval [min] info	60 min																								
Emergency SMS No.																									
Time zone	GMT +01 Belgrade, Bratislava, Budapest, Ljubljana, Prague																								
Data transfer interval every day	<table> <tr> <td><input checked="" type="checkbox"/> 0:00</td> <td><input checked="" type="checkbox"/> 1:00</td> <td><input checked="" type="checkbox"/> 2:00</td> <td><input checked="" type="checkbox"/> 3:00</td> </tr> <tr> <td><input checked="" type="checkbox"/> 4:00</td> <td><input checked="" type="checkbox"/> 5:00</td> <td><input checked="" type="checkbox"/> 6:00</td> <td><input checked="" type="checkbox"/> 7:00</td> </tr> <tr> <td><input checked="" type="checkbox"/> 8:00</td> <td><input checked="" type="checkbox"/> 9:00</td> <td><input checked="" type="checkbox"/> 10:00</td> <td><input checked="" type="checkbox"/> 11:00</td> </tr> <tr> <td><input checked="" type="checkbox"/> 12:00</td> <td><input checked="" type="checkbox"/> 13:00</td> <td><input checked="" type="checkbox"/> 14:00</td> <td><input checked="" type="checkbox"/> 15:00</td> </tr> <tr> <td><input checked="" type="checkbox"/> 16:00</td> <td><input checked="" type="checkbox"/> 17:00</td> <td><input checked="" type="checkbox"/> 18:00</td> <td><input checked="" type="checkbox"/> 19:00</td> </tr> <tr> <td><input checked="" type="checkbox"/> 20:00</td> <td><input checked="" type="checkbox"/> 21:00</td> <td><input checked="" type="checkbox"/> 22:00</td> <td><input checked="" type="checkbox"/> 23:00</td> </tr> </table>	<input checked="" type="checkbox"/> 0:00	<input checked="" type="checkbox"/> 1:00	<input checked="" type="checkbox"/> 2:00	<input checked="" type="checkbox"/> 3:00	<input checked="" type="checkbox"/> 4:00	<input checked="" type="checkbox"/> 5:00	<input checked="" type="checkbox"/> 6:00	<input checked="" type="checkbox"/> 7:00	<input checked="" type="checkbox"/> 8:00	<input checked="" type="checkbox"/> 9:00	<input checked="" type="checkbox"/> 10:00	<input checked="" type="checkbox"/> 11:00	<input checked="" type="checkbox"/> 12:00	<input checked="" type="checkbox"/> 13:00	<input checked="" type="checkbox"/> 14:00	<input checked="" type="checkbox"/> 15:00	<input checked="" type="checkbox"/> 16:00	<input checked="" type="checkbox"/> 17:00	<input checked="" type="checkbox"/> 18:00	<input checked="" type="checkbox"/> 19:00	<input checked="" type="checkbox"/> 20:00	<input checked="" type="checkbox"/> 21:00	<input checked="" type="checkbox"/> 22:00	<input checked="" type="checkbox"/> 23:00
<input checked="" type="checkbox"/> 0:00	<input checked="" type="checkbox"/> 1:00	<input checked="" type="checkbox"/> 2:00	<input checked="" type="checkbox"/> 3:00																						
<input checked="" type="checkbox"/> 4:00	<input checked="" type="checkbox"/> 5:00	<input checked="" type="checkbox"/> 6:00	<input checked="" type="checkbox"/> 7:00																						
<input checked="" type="checkbox"/> 8:00	<input checked="" type="checkbox"/> 9:00	<input checked="" type="checkbox"/> 10:00	<input checked="" type="checkbox"/> 11:00																						
<input checked="" type="checkbox"/> 12:00	<input checked="" type="checkbox"/> 13:00	<input checked="" type="checkbox"/> 14:00	<input checked="" type="checkbox"/> 15:00																						
<input checked="" type="checkbox"/> 16:00	<input checked="" type="checkbox"/> 17:00	<input checked="" type="checkbox"/> 18:00	<input checked="" type="checkbox"/> 19:00																						
<input checked="" type="checkbox"/> 20:00	<input checked="" type="checkbox"/> 21:00	<input checked="" type="checkbox"/> 22:00	<input checked="" type="checkbox"/> 23:00																						

submit

The logging interval is set to 60 minutes by default. Shorting the logging interval will increase the power consumption and the data transfer costs. It can be set to every multiple of 5 minutes in between 10 and 120. The time zone has to be set. For data transfer all 24 hours can be selected. Using less transfer times will decrease the data transfer costs. The settings are send to the web server by pressing the “**submit**” link.

3.7 Defining the iMETOS Location

It is more than helpful to define the iMETOS location. First it is the base of geo linked services on iMETOS and second it helps the team doing services on you iMETOSa lot when they can find the iMETOS without the help of you or your employees.

To define the location a map service is used in which you can select the map or the satellite view. If you enter the address where the iMETOS is installed the correct part of the map will be opened. The zoom + and – allows you to zoom inot the map and you can set the iMetos very accurate in its real position. Please enter the altitude if you like to use weather forecast for this device.

If you have the correct GPS position on base of you car navigation system or the agricultural GPS you can enter this data and press the “**submit**” link. Now you can see if the position is correct by checking the map.

After choosing the correct position please enter the submit button.

Location(0000000D, Sernum. 0000000D)

Latitude

Longitude

Altitude

↑

← →

↓

+

-

Karte

Satellit

Hybrid

×

Latitude 37.21562
Longitude 14.06471

Fattoria Deliella

POWERED BY

Google

Kartendaten ©2011 Tele Atlas - [Nutzungsbedingungen](#)

Your adress:

3.8 SMS Alerts Numbers

To use the SMS alerts two links are needed. Both can be used first. The SMS numbers are used in case an alert has to be send. Please enter here the telephone number with the country code. The name entered before the telephone number is not used by the iMETOS. It is a service for you to memorise to whom the iMETOS should send the SMS message.

Enter the number and the name and press the “**submit**” link. If you like to delete a telephone number form the list us the red cross left to name and number.

SMS Phones(0000000D, Sernum. 0000000D)

Phone number	Name							
00436641521544	Heiner Denzer	X						
<div> Add </div> <table> <thead> <tr> <th>Phone number</th> <th>Name</th> <th></th> </tr> </thead> <tbody> <tr> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="button" value="submit"/></td> </tr> </tbody> </table>			Phone number	Name		<input type="text"/>	<input type="text"/>	<input type="button" value="submit"/>
Phone number	Name							
<input type="text"/>	<input type="text"/>	<input type="button" value="submit"/>						

3.9 SMS Alerts Thresholds

To use the SMS alerts two links are needed. Both can be used first. The “**SMS Warning**” link opens a screen which allows selecting a threshold for alert on overgoing (max) or undergoing (min) this. Press the edit button beside of the sensor a threshold has to be set.

SMS Warning(00000000D, Sernum. 00000000D)

Code	Chain	Channel	Name	Warning	Unit	Warning
1	0	3	Relative humidity	min	~	
1	0	3	Relative humidity	max		
0	0	4	Air temperature	min		
0	0	4	Air temperature	max		
7	0	7	Battery voltage	min		
7	0	7	Battery voltage	max		

Back to

Warning Thresholds [info](#)

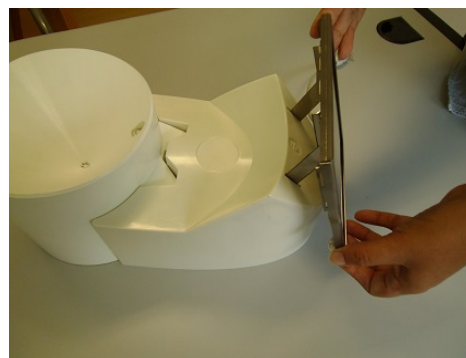
Sensor	Air temperature
Sensor code	0
Sensor Chain	0
Sensor Ch	4
Unit	C
	min
1	<input type="button" value="delete"/>
2	<input type="button" value="delete"/>
3	<input type="button" value="delete"/>
<input type="text"/>	<input type="button" value="add"/>

No a new screen comes up giving you the possibility to enter the values you wish. After every value you have to press the “**add**” link. Values which are in the list can be deleted by pressing the “**delete**” link.

The number of possible thresholds is various depending iMETOS type. It showed that it has been enough for all applications.

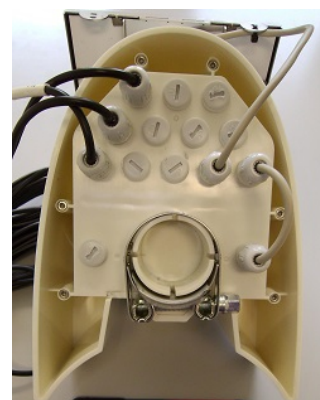
4 Installing the iMETOS eco d2

The iMETOS eco d2 is one plastic part which contains all the electronics, the battery and the antenna. If it is equipped with a rain gauge, it is just a little longer than without. The heaviest part is the battery. Therefore the clamp for the pole sits below it. The solar panel is hanging on a short cable.



4.1 Mounting the solar panel.

The solar panel is connected with the main body by a short cable. It is packed in plastic film to be protected from transportation damage. Please unpack it and insert its legs into the two cuts at the top of the iMETOS.



4.2 Mounting the iMETOS eco d2 on a pole

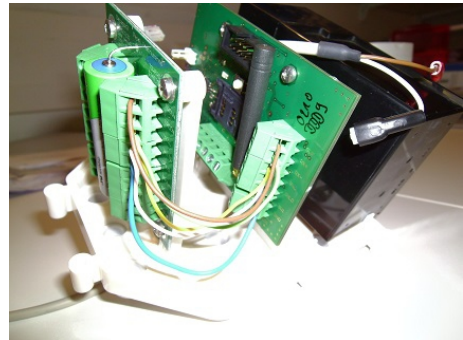
At the bottom of the unit there is a plastic ring with a metal clamp on. This fits on a 33 mm pole. Please hammer a pole of 1.2 to 2m straight into the ground and set the iMETOS eco d2 on it. The solar panel should be directed towards the sun (South on northern hemisphere and North on southern hemisphere). Fix the screw on the clamp with a 10 mm spanner.

4.3 Soil Temperature

The soil temperature sensor should be buried in earth. How deep it should be buried is depending from the goal which should be reached with the sensor. To have an impression of root growth and nitrogen mineralization in vines or apples in early spring it is best to bury it by 10 to 20 cm. If you want to assess the emergence possibilities of seeds it is depending on the seeding depth of the seed. Using it in corn (maize) would mean to bury it by 5cm and using it for sugar beets would mean to bury it by 2 or 3 cm only.

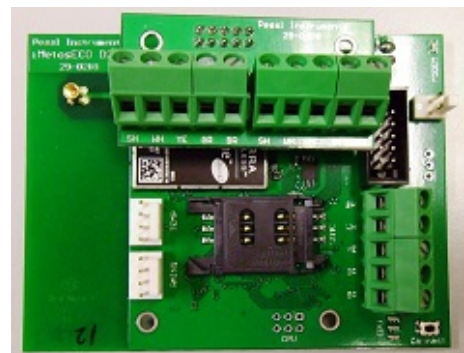
5 Installing the soil moisture sensors

iMETOS eco d2 is designed to monitor soil moisture at the crop and to present this data on FieldClimate.Com. The GPRS or EDGE networks are allowing you to install the device wherever you need it. iMETOS might be used to monitor only one site or it can be used to monitor several sites in a short distance. These sites will be connected by cables.



iMETOS eco d2 supports different ways of soil moisture measurement. All these different sensors will need a different electronic. For this purpose it will always consist of the main PCB (responsible for the logging and the communication) and in minimum one second PCB (responsible for sensor evaluation). If it is made to monitor one spot this second and only sensor evaluation PCB will be in the same box than the main PCB. If it is made to monitor several sites with a cable connection these other sites will have their own sensor evaluation PCBs in their own boxes.

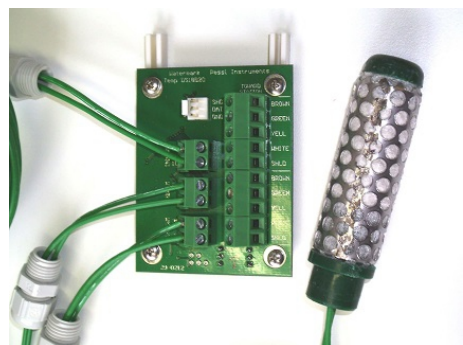
All the PCBs for sensor evaluation do have a line going towards the iMETOS and a line going towards the next PCB for sensor evaluation. Several of these sensor evaluation PCBs can be linked together in a chain. Nevertheless, it might be needed to create a network where the sensing sites are going in two or three directions away from the iMETOS. In this case the iMETOS eco d2 supports up to 3 sensor chains. For sensor chain 2 and 3 an extension PVB is needed.



5.1 Watermark Sensors

Watermark sensors measure water tension. These sensors measuring range is between 100 and 2000 mbar (10 to 200 kPa or cBar). This sensor fits many horticultural crops, berries, stone fruits, vines and potatoes. Watermark sensors are easy to use and frost-proof.

Basically it is a gypsum block. The gypsum is embedded in a matrix material. And it gives a defined response in resistance on different water tension levels. We can measure the water tension on 3 to 5 cBar accuracy.



It showed that it works faster if it is wetted for 24 hours before installation. If you install it in the ground you will need a hole with the correct depth. Lay it horizontally on the ground and let the cable go horizontally first to before you take it up to the top. This avoids water following the cable in the ground reaching and wetting the sensor.

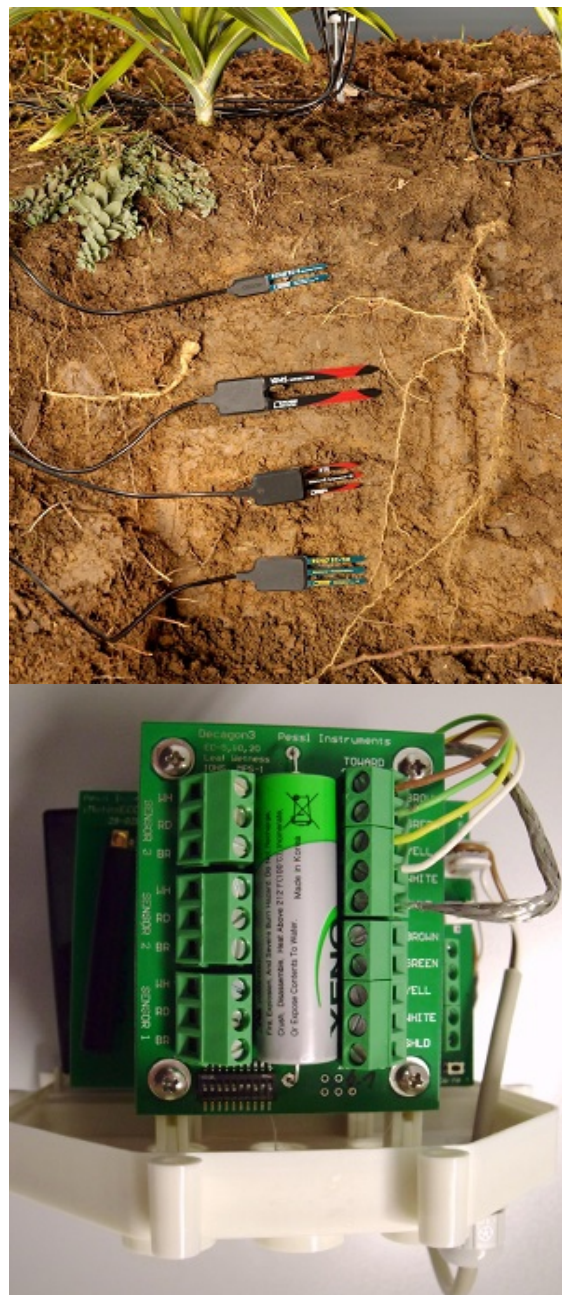
The watermark PCB can be equipped with an own soil temperature sensor. This sensor is used to do the temperature compensation of the water tension measurement. It allows you to measure the soil temperature in specific blocks where you measure water tension. The irrigation might influence the soil temperature what can be important in asparagus per example.

5.2 ECH₂O sensors

From the range of sensors produced by Decagon LTD we are supporting 2 capacitive soil moisture sensors EC5 and HS10 and the soil moisture and conductivity sensor TE5. EC5 is a 5 cm long sensor in the shape of a 2 legged fork. HS10 has the same shape but it is a 10 cm long and a little stronger than its smaller co product. In an ideal soil it is possible to press these sensors into the ground. In this case you might dig a hole down to the maximum depth you like to burry the sensor and you insert the lowest sensor straight into ground and the other sensors will be pressed into the site walls of the hole.

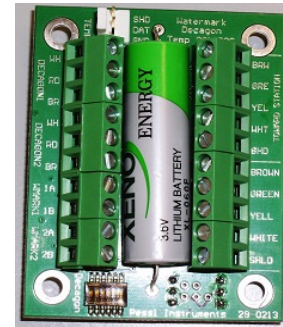
As soon as you have structured organic matter or stones in the soil this way of installation is not possible. In this case you will have to dig a trench and to make smaller holes with the different depths you like to install the sensors. Take some of the soil of the different holes and mix it carefully with water to form a slurry a dry as possible. Insert this slurry into the hole and now you can insert the sensor vertically into this slurry. The cables can be buried in the trench.

The PCB supporting the ECH₂O sensors can take 3 sensors. It is possible to connect a wide range of different sensors to this PCB. Therefore a compound with 10 dip switches is on this PCB. 9 of this switches are needed. The first 3 switches are for sensor 1, Switch 4 to 6 is for sensor 2 and switch 7 to 9 is for sensor 3. If an EC5 is connected the switches have to be off, off, off. A HS 10 sensor needs the settings On, Off, Off. The TE5 sensor for soil moisture and conductivity needs the setting On, On, Off.



5.3 Joining Soil moisture and Water Tension

Soil moisture measured with capacitive sensors like EC5, HS10 or TE5 responds very well on irrigation, rain or water use by plants. Nevertheless it does not tell if the water is easy available for hardly hold by the soil. Sensors giving water tension like tensiometers or watermark sensors are showing the plant availability of the water much better. These sensors are limited to show the dynamics of the soil water. To use the benefits of both systems Pessl Instruments have developed a PCB on which we can evaluate 2 watermark sensors, 2 ECH₂O probes and a soil temperature.



5.4 Tensiometer

Pessl Instruments is delivering tensiometers of different length from Irrometer LTD. For this tensiometer we deliver screw in pressure adapter. 4 of these adapters can be connected to the tensiometer interface. The tensiometer interface consists of a barometric sensor more which is used as a reference for the tensiometers.

The four tensiometers are connected with 5 m cable to the PCB. It is a 3 wire cable. It is connected with shield (sh), white (wh), green (gr) and brown (br).



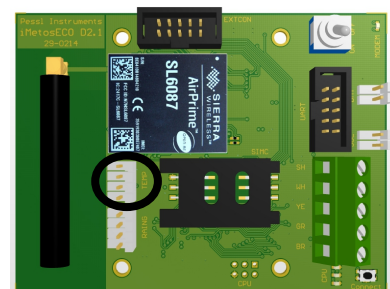
6 Installing new sensors on the iMETOS

Each iMETOS can be expanded to the maximum possible number of sensors. It is equipped with specific inputs for rain, and soil or air temperature. Beside of this it has 3 digital inputs which can be used for a range of different soil moisture sensors and sensor chains.

6.1 Installing soil or air temperatures



iMETOS eco d2 can be equipped with a soil temperature sensor. The sensor is connected to the 4 pin PanCon Connector labelled with Temp.



6.2 Installing a rain gauge

If you like to expand the iMETOS eco d2 by a rain gauge Pessl Instruments or your distributor will send you a new cover for the iMETOS eco d2 including the rain gauge. You will have to remove one of the covers from the bottom of the housing and put the cable with the cable gland into this opening. Make sure that you screw in the cable gland carefully and the seal closes the hole tight. The rain gauge connects to the 4 pin PanCon connector labelled with rain.

7 Maintaining the iMETOS

When the solar panel of the iMETOS is exposed to the sun and it gets enough sunlight it should recharge the lead acid battery of the system constantly. With this the system should have enough power for years. The lifespan of the lead acid battery can be expected to be 5 to 6 years with sufficient reloading from the solar panel. Insufficient reloading will shorten the lifetime of the battery. In case of insufficient reloading of the battery the system will reduce the frequency of data upload to the amount which is needed to make sure that no data will be missed on the server. With this power use will be reduced and battery power will last longer.

The maintenance needed for the sensors depends on the different sensors. Temperature sensors will not need any maintenance for their lifetime whereas the rain gauge will only work properly when it is cleaned periodically.

7.1 Maintaining the rain gauge

The funnel of the rain gauge has several small holes to lead the water into the dipping bucket. These holes need to be closed by leaves. Please check the funnel periodically for leaves. The inner side of the rain gauge is a very attractive refuge for several insects. Please check this specially at the end of summer where wasps tend to use the funnel.

The rain gauge can be recalibrated if this is needed. It should tip at 4ml filled into the double spoon. The tipping point can be selected by the white plastic screws below the spoon.



8 Uninstalling

iMETOS eco d2 is mainly used for soil moisture monitoring. If this is in a permanent crop, it can be out in the field for its lifetime. But it might be that it should change the position or that the crop will not last for longer. In this case the iMETOS eco d2 has to be uninstalled. If you do so plan some time for it. If you like to remove the soil moisture sensors ready for reusing you have to dig carefully behind the cables. Make sure that you will not damage them. If the iMETOS will be installed immediately after this at another site, do this. If the iMETOS should wait in a shed for the next season, please disconnect the battery. For this you have to open the housing with the six screws. The Allen key which came with it was 2.5 mm. If you do not disconnect the battery the iMETOS will send data for another 2 months and after this the battery will be too weak. If you like to use it in the next spring it will need several days in sun before it can transmit data again.

General Terms and Conditions of Trade

§ 1 Application of Terms

- (1) Our deliveries and services are subject to the following Terms and Conditions of Trade. We do not accept opposing terms and conditions on the part of our customer or terms and conditions deviating from our own Terms and Conditions of Trade unless such agreement is given expressly and in writing.
- (2) Our Terms and Conditions of Trade also apply if we carry out an order without reservation, while being aware of opposing or deviating terms and conditions on the part of the customer. We hereby expressly reject order confirmations given by the customer which refer to his deviating terms and conditions of purchase.
- (3) Our Terms and Conditions of Trade also apply to all future business transaction with our customer.

§ 2 Offers and Conclusion of a Contract

- (1) Unless agreed upon otherwise, we are bound to our orders for 14 days starting with the date of the offer. After that we can revoke them, even after their acceptance by the customer.
 - (2) The customer is bound to his order for 14 days. Our acceptance is given in writing, by telefax or by e-mail, unless we deliver or invoice immediately.
- The same applies in the event of amendments, modifications and collateral agreements.
- (3) This form is the binding order confirmation.

§ 3 Scope of Deliveries and Services

- (1) The scope of deliveries and services is determined by the agreements between the parties. Information regarding the scope of deliveries and services do not constitute any warranty on our part to assume the risk of availability of sub-supplies. We reserve the right to claim that we ourselves were not supplied correctly or on time by our suppliers. Any guarantee or any warranty as to the availability of the products or their components requires an express written agreement between the parties, in which the terms “guarantee” or “risk of availability” are expressly used.
- (2) The details given in our offer/our order confirmation shall determine the quality of the products, which is owed by us. In case of discrepancies between the offer and the order confirmation, the order confirmation shall prevail. Specifications contained in catalogues, brochures, circulars, advertisements, illustrations and price lists are not binding, unless they have been expressly become part of the contract. Details mentioned in our order confirmations and drawings which relate to the quality of the product do not constitute any guarantees, particularly no guarantees as to the durability. Even after conclusion of the contract we are entitled to deliver a comparable product instead of the product agreed upon, provided that this product has been improved compared to the stipulated product and complies with all functions stipulated by the contract. This applies particularly also to additional functions, which were not included in the delivery object originally agreed upon.
- (3) In so far as we deliver software, the details given in the description and the documentation of this software shall determine the quality of this software. We carry out the installation of software only on the basis of a separate agreement. If no such agreement exists, the installation shall be carried out by the customer.
- (4) The scope of deliveries and services does not include training of the customer's employees. A training course needs to be agreed upon between the parties expressly and in writing.
- (5) We only assume responsibility for installation if expressly agreed between the parties in text form under the Austrian Civil Code.

Unless otherwise agreed upon, installation by us is limited to putting the delivery object up and putting it into operation. These are obligations resulting from the sale of the product. An acceptance of performance under the law of contracts for work and services does not take place.

§ 4 Use of the Software

- (1) In so far as the delivery objects include software or we deliver software subsequently, the customer is granted a non-exclusive license unlimited in time, the scope of which is defined as follows.
- (2) The customer is entitled to reproduce the software delivered or contained in the product only as far as the respective reproduction is necessary in order to use the delivery objects. Necessary reproductions include the installation of the software, which is recorded on the original data carrier, on the bulk memory of the product as well as loading the software on the internal memory. Furthermore the customer may copy the software for backup purposes. However, only one single backup copy shall be made and kept. This backup copy shall be marked as backup copy of the delivered software and shall carry a reference to our intellectual property visible on the data carrier.
- (3) Multiple use of our software and/or use in a network requires our express consent in text form under the Austrian Civil Code and a respective supplementary agreement.
- (4) Recompiling the software to other code forms as well as other types of reverse engineering including changes of the software must be approved by us in advance and in writing. Should we refuse to remedy a defect and should the above-mentioned proceedings be necessary for the correction of the defect, our consent is not required.
- (5) The customer is not entitled to sell or give away the software itself, without the delivery object, to third parties without our written consent.

§ 5 Cooperation of the Customer

(1) The customer is obliged to cooperate in every respect required for the performance of our contractual obligations. Unless agreed upon otherwise between the parties, particularly the following cooperation is required:

- As regards installation of hardware the customer is obliged to put at our disposal premises equipped with a periphery that meets all necessary technical requirements for the installation of the hardware. Shall our delivery objects be connected to the internet the customer must provide the necessary telecommunication access features in working order.

- As regards the installation of software the customer has to provide us with the hardware, on which the software due is to be installed and to keep this hardware in a condition ensuring a 100 per cent working order.

(2) Should the customer not comply with his cooperation duties and should we thereby incur additional expenses, e.g. travelling expenses, expenses for hotel accommodation, or personnel costs, the customer is obliged to reimburse such additional expenses. Waiting periods caused by the customer's failure to perform his cooperation duties will be billed on the basis of our usual hourly rates.

§ 6 Prices

(1) Unless agreed upon otherwise, our prices are ex works, plus the turnover tax applicable in the Federal Republic of Austria at the respective time. Unless agreed upon otherwise, all other costs are to be born by the customer, for example costs for packaging, transport, insurance, customs etc.

(2) The prices mentioned in our offer are based on our calculations at the time when our offer is made. Should the prices for technical components required for the delivery objects increase by at least 10 per cent after the offer was made respectively the contract was concluded concerning a contract which provides for an obligation of one of the parties which lasts for more than 4 months, we are entitled to increase the stipulated prices by the proportional extra costs.

(3) Invoices are made out in the agreed currency subject to the proviso that the exchange rate (parity price) of the Euro valid on the date of delivery shall serve as the basis for calculation.

§ 7 Payment

(1) Payments shall become due on the agreed date for payment. If no date for payment has been fixed, payments will become due upon receipt of the invoice or an equivalent statement of account. Should the date of receipt of the invoice or the statement of account be uncertain, payments will become due upon receipt of our deliveries or services.

(2) If more than one invoice is outstanding, payments made by the customers will be used to settle the claim longest outstanding.

(3) Payments by draft or check are not considered as payment in cash. Drafts or check are only accepted by way of provisional performance. All discount charges, collection charges, fees or taxes resulting from the acceptance, transfer or cashing of a draft are to be born by the customer. We are not obliged to present drafts, check and other methods of payment on time. If a draft is not discounted or not cashed on time, the entire outstanding debt or the balance of the debt is due for payment.

(4) If the customer does not meet his payment obligations, particularly if he stops payments, we are entitled to claim the entire outstanding debt at once, even if we have already accepted check or drafts. In this event we are also entitled to refuse to carry out the performance of our outstanding obligations, until the customer effects payment or provides sufficient collateral securities.

(5) The customer is not entitled to set off his claims against ours, or to a right of retention, unless his counter claims have been either acknowledged by us or finally established by a Court of Law.

§ 8 Terms of Delivery, Default and Non-Performance

(1) Terms and dates indicated by us are not binding, unless they have been expressly fixed in our order confirmation in writing. Delivery time is the date fixed in writing in the order confirmation. Should all documents, necessary approvals, cooperation etc. to be supplied by the customer not be produced at least one month before the date of delivery, said date of delivery shall be extended by one month, starting with the date on which all the above-mentioned documents, necessary approvals, cooperation etc. have been completed and received.

(2) The date of delivery shall be considered as having been met if the goods have left our factory within the agreed time of delivery, or, in the event of collection by the customer he has been informed of our readiness for shipment.

(3) If we can prove, that we have not been supplied on time by one of our suppliers despite careful selection of our suppliers and despite the conclusion of the necessary contracts under reasonable conditions, the term of delivery shall be extended by the delay which has been caused by our supplier's failure to supply us on time. Should the before-mentioned hindrance last for more than one month, the customer shall be entitled to cancel the contract with respect to the part not yet fulfilled. Claims for compensation are excluded in this event.

We shall only be entitled to avail ourselves of the above-mentioned circumstances if we inform the customer about them immediately, i.e. within 3 working days after we have obtained knowledge.

(4) In the event of our being prevented from fulfilling our contractual duties after the conclusion of the agreement by unforeseen, unusual circumstances, which could not be prevented despite taking appropriate measures under the

individual circumstances, particularly by interruption of operations, administrative sanctions or interventions, delays of the supply of essential raw material, energy shortages, etc., the delivery period will be reasonably extended. Should performance of delivery become impossible due to the above-mentioned circumstances, we shall be released from our obligation to deliver.

If the above-mentioned circumstances persist for more than one month, both parties shall be entitled to cancel the contract with respect to the part not yet fulfilled.

The customer is not entitled to claim damages from us in these cases of force majeure. We shall only be entitled to avail ourselves of the above-mentioned circumstances if we inform the customer about them immediately.

This provision applies accordingly in the event of lockouts or strikes.

(5) In the event of delay in accepting performance, the customer has to indemnify us for the loss caused by this breach of contract, in particular for expenses incurred as a result of the storage of the goods. This does not apply if this breach of contract is not attributable to the customer. In this case the customer's obligation to reimburse costs is limited to the expenses incurred by us due to the storage of the goods. After fixing an adequate time limit for accepting delivery but without success, we are further entitled to dispose otherwise of the goods and to supply the customer within a reasonably extended term.

The customer is obliged to effect payments by the agreed date for payment even if he is in default of acceptance. In so far as we dispose otherwise of the goods, the customer is no longer obliged to pay interest on the overdue accounts as of the date of such an otherwise disposal. However, we are not obliged to dispose otherwise of the goods.

§ 9 Passing of the Risk/Shipment

(1) If the delivery object is shipped to the customer upon his request, or if the handing over is done – as it normally is – ex works, the risk of accidental destruction or accidental deterioration of the merchandise passes to the customer together with the handing over to the person entrusted by us with the dispatch, but no later than when the merchandise leaves our works or warehouse; this risk passes irrespective of whether the dispatch took place from the place of performance or who bears the freight costs. If the merchandise is ready for shipment and the shipment or accepting delivery of the merchandise is delayed due to circumstances beyond our responsibility, the risk passes on to the customer upon his receiving our notice of readiness for shipment. We arrange for an insurance of the delivery objects only on the customer's express request.

(2) Unless otherwise determined by the customer, the mode of shipment is at our discretion. We are under no obligation to use the cheapest mode of shipment. The packaging will be invoiced and not be taken back, unless stipulated otherwise by legal provisions, e.g. the "Verpackungsverordnung", or unless otherwise agreed between the customer and us in a particular case.

(3) Samples, originals, and other objects provided by the customer will be stored in an appropriate manner. It is incumbent upon the customer to arrange for any theft, fire, water or other risk insurance; unless the customer entrusts us to effect a respective insurance the costs of which are to be born by the customer. The same applies accordingly if we store goods produced for the customer on his request.

§ 10 Retention of Title

(1) Delivered goods shall remain our property until all outstanding debts resulting from the business relationship between us and the customer have been paid in full. The customer is entitled to resell the goods within his normal business.

(2) In the event of processing or combination of the delivered goods, the retention of title also applies to the new goods and we shall be considered as their manufacturer. If our merchandise is processed or connected with goods or equipment of third parties, we do not own, we will own the share of the joint property in the new object which is determined by the ratio of the invoice value between our merchandise and the other processed merchandise.

(3) If the delivery object is inseparably connected with other objects, we do not own, we will own the share of the joint property in the new object which is determined by the ratio of the value between the delivery object and the other combined goods at the time of their combination.

(4) The outstanding claims of the customer resulting from resale of the goods to a third party shall be considered to have already been assigned by the customer to us at his very moment in total or to the amount of our share of the joint property as security (cf. § 10 clause (2)); we hereby accept the assignment. The customer is entitled to collect these claims until we revoke this authorization or he stops payments. The customer is not entitled to assign these claims, not either in order to collect these debts by way of factoring unless the factor is obliged to transfer the collected amounts directly to us as long as we still have outstanding claims against the customer.

Upon our request the customer must give us the information necessary for collecting the assigned claims, including a copy of the contract with his customer, the invoice and a list of the payments received from his customer.

(5) The customer will advise us immediately of any compulsory execution measures levied by third parties against merchandise sold by us under retention of title, or against claims assigned to us in advance, and will forward to us the documents required for an intervention from our side.

(6) If the customer is in default with his payments twice within six months, or if the customer is insolvent or objective criteria indicate his insolvency, we shall be entitled, in the case of resale of the goods, to collect the assigned outstanding amounts directly from the customer's customer. Our right to cancel the contract remains unaffected.

(7) At the request of the customer we are obliged to release the security to which we are entitled at our own discretion, should the value of such security exceed the claims to be secured by more than ten per cent.

(8) The customer holds the merchandise sold by us under retention of title for us. He must effect fire, theft and water insurance for it. The customer hereby assigns his claims for compensation against insurance companies and other persons or entities liable for compensation resulting from the kind of damages mentioned in sentence 2 to us to the amount of our respective claim. Should there be a prohibition of assignment, the customer guarantees, that the insurer expressly grants consent to the assignment.

§ 11 Product Control and Product Warning Obligations

(1) In order to protect third parties against dangers which may emanate from our products, the customer is obliged to monitor the product continuously with regard to its safety (product control obligation). The customer will advise us of dangers emanating from the product immediately in writing as soon as such dangers become apparent (product warning obligation).

(2) If claims based on violation of the product control obligation and/or the product warning obligation should be asserted against us by third parties, such liability will be passed on to the customer, if our liability has been caused by a violation of the product control obligation and/or the product warning obligation attributable to the customer.

§ 12 Notice of Defect

The customer's obligation to examine the goods and to make a complaint in respect of a defect immediately on receipt is determined by Austrian Commercial Code (HGB).

§ 13 Liability for Defects/Limitation Period

(1) If the delivered goods and/or the installation and/or the documentation are defective or if certain conditions of the goods do not comply with a guarantee given by us, we have the choice of either repairing the defective goods or replacing them by goods free of defects.

(2) Should two efforts to remedy a defect fail, the customer shall be entitled to choose whether to cancel the contract or to reduce the purchase price.

If the defect has been caused by gross negligence or willful intent on our part, the part of our vicarious agents or persons employed by us in the performance of our obligations and/or if the defect leads to a breach of essential contractual obligations (cardinal obligations) attributable to us, and/or to attributable personal injury, injury to life or to health, or if we have given a guarantee for certain conditions of the goods, the customer may also claim damages. Should our breach of cardinal obligations have been caused by slight negligence and result in financial damage or damage to the customer's property, the claim for damages is limited to typically foreseeable losses.

In these cases there shall be no liability for production stoppages or lost profit.

This limitation on liability applies accordingly to our vicarious agents and persons employed by us in the performance of our obligations.

(3) Should we choose to repair the defect, we shall bear the expenses incurred. This does not include costs resulting from the fact, that the customer has moved the delivered goods from the customer's headquarters or from the delivery location.

If the repair of the defect consists of the exchange of plug-in parts, which can be exchanged without additional technical changes, we may perform our obligation to remedy the defect by sending the plug-in part to the customer combined with instructions for the exchange.

(4) The customer is not entitled to warranty claims

- with regard to defects which have been caused by unreasonable treatment or excess wear by himself or his own customers,

- in the event of operating errors or application errors,

- if the delivery object has been tampered with or altered by incorporating parts not originating from us, except where the defect has not been caused by such changes,

- where assembly or usage instructions, of which we have informed the customer, have not been observed by the customer or his own customers, except in cases where the defect has not been caused by such non-compliance,

- for the suitability of the merchandise for a particular purpose of use, unless this specific use is mentioned in the order confirmation or in written instructions enclosed with the goods, or the suitability for a particular purpose of use has been expressly confirmed by us.

If the defect has been caused by a circumstance, which does not oblige us to warranty, the customer will reimburse us for all expenses caused by his claim.

(5) The regular limitation period for claims based on defects of the delivered goods, which are usually not used for buildings, is 1 year from the delivery of the goods to the customer and, in cases of an installation due by us, from the performance of the installation.

In so far as we are liable for damages the shortening of the limitation period does not apply to claims for damages based on defects caused by gross negligence or willful intent, attributable breach of essential contractual obligations (cardinal obligations), as well as personal injury, injury to life or to health attributable to us, or if we have given a

guarantee as to a certain quality of the goods.

If we have expressly given a guarantee as to a certain quality of the product, the limitation period for claims resulting from this guarantee is 2 years from delivery of the sales object, to which the guarantee relates. If we have given a guarantee as to the durability, the limitation period for claims resulting from this guarantee expires when the term, for which the guarantee as to the durability was given, ends. This limitation period also starts from the delivery of the goods, to which the guarantee relates.

If the duration of guarantee is less than one year, the limitation period is defined by § 13 clause 5 of these General Terms and Conditions of Trade.

(6) If the delivered goods are second-hand goods, any liability for defects is excluded. This limitation on liability does not apply to claims for damages based on gross negligence or willful intent, attributable breach of essential contractual obligations (cardinal obligation), as well as attributable personal injury, injury to life or to health, as well as in case of a guarantee given by us as to a certain quality of the product.

(7) Any possible application of the Product Liability Act remains unaffected.

§ 14 Claims for Compensation Resulting from Breaches of Duties to Protect, Default and Non-Performance

(1) Our liability for defects as to quality and defects of title are not affected by this section (§ 14). The provisions of §§ 13 and 15 of these General Terms and Conditions of Trade apply to this kind of liability.

(2) Claims for compensation resulting from other breaches of duties on our part, particularly duties to protect interests warranting protection and/or obligations arising out of quasi-contractual relationships are excluded unless they are based on gross negligence or willful intent, attributable breach of essential contractual obligations (cardinal obligations), or personal injury, injury to life or health caused by us, our vicarious agents or persons employed by us in the performance of our obligations.

If we are liable for breach of cardinal obligations based on slight negligence, the claim for compensation of financial damages and damage to property is limited to typically foreseeable losses.

In these cases there shall be no liability for production stoppages or lost profit.

(3) This limitation on liability provided for under § 14 clause 2 applies accordingly to claims in tort.

(4) Claims for compensation resulting from delay in delivery or from failure to perform cannot be asserted against us unless they are based on willful intent or gross negligence on our part, on the part of our vicarious agents or persons employed by us in the performance of our obligations.

This limitation on liability does not apply in the event of breach of essential contractual obligations (cardinal obligations) attributable to us.

If we are liable for damages based on slight negligence (breach of cardinal obligations), the claim for damages is limited to typically foreseeable losses.

In these cases of slight negligence there shall be no liability for production stoppages or lost profit.

Any possible right to cancellation of the contract, which the customer may have in the event of delay in delivery or failure to perform remains unaffected by this limitation on liability.

(5) Claims for compensation resulting from other breaches of duties, default or non-performance under this section, which are no claims for defects as to quality and/or defects of title, are subject to a limitation period of one year as of the end of the year during which the claim arose and the customer obtained knowledge of the circumstances justifying the claim or his lack of such knowledge was due to gross negligence. The maximum time periods for limitation of actions provided for under § 199 Sec. 2 and 3 Austrian Civil Code remain unaffected by this provision.

This restriction does not apply to claims for damages based on gross negligence or willful intent, attributable breach of essential contractual obligations (cardinal obligations), as well as personal injury, injury to life or health, caused by us, our vicarious agents or persons employed by us in the performance of our obligations.

(6) Any possible application of the Product Liability Act remains unaffected.

§ 15 Intellectual Property Rights

(1) Claims for compensation resulting from the infringement of trademarks, patents, patent applications, utility models, registered designs or copyrights of third parties against us, our vicarious agents or persons employed by us in the performance of our obligations are excluded, unless they are based on gross negligence or willful intent of ourselves, our vicarious agents or persons employed by us in the performance of our obligations or we have guaranteed that the above-mentioned intellectual property rights will not be infringed.

This limitation on liability does not apply in cases of breach of essential contractual obligations (cardinal obligations) attributable to us, our vicarious agents or persons employed by us in the performance of our obligations.

If we, our vicarious agents or persons employed by us in the performance of our obligations are liable for damages based on slight negligence (breach of cardinal obligations), the claim for damages is limited to typically foreseeable losses.

In these cases of liability based on slight negligence there shall be no liability for production stoppages or lost profit.

This limitation on liability applies accordingly to our vicarious agents and persons employed by us in the performance of our obligations.

(2) The customer's right to cancel the contract due to the infringement of the above-mentioned intellectual property rights remains unaffected.

(3) Where claims based on the infringement of third party rights are asserted against us, the customer may prove this defect of title only by having a final judgement of a Court of Law entered against him. This does not affect the customer's right to make us a third party defendant in the infringement lawsuit.

§ 16 Suspension of the Limitation Period Due to Negotiations

(1) Negotiations concerning liability for defects or other claims for damages shall only be considered to exist, if the parties have stated in writing, that they are negotiating such claims. Should the reference to this requirement in writing constitute an abuse of legal rights, neither party may plead the observance of same.

§ 17 Trade Secrets/Data Protection

(1) Plans, drawings and technical particulars, which we hand over to the customer, remain our property. The handing over of the documents mentioned does not create any rights of the customer in these documents, particularly no license. The customer may not use these documents, particularly he may not copy them, reproduce them or hand them over, make them accessible to or disclose them to third parties without our written consent. This applies even if the documents are not marked as confidential information.

(2) The customer ensures, that his employees, consultants, shareholders and others, who will become privy to these trade secrets, will be obliged in writing to safeguard our trade secrets to the extend described above.

(3) These obligations continue to apply after the termination of contractual relations.

(4) We are entitled to process data concerning the customer, which we obtain regarding the contractual relationships or in connection with them, irrespective of whether they come from the customer himself or from third parties, in observance of the Data Protection Act.

§ 18 Place of Performance, Applicable Law, Place of Jurisdiction, Partial Invalidity

(1) Place of performance with regard to deliveries and payments is Weiz.

(2) These General Terms and Conditions of Trade and the entire contractual relationship between us and the customer shall be subject to the law of the Federal Republic of Austria, excluding the UN-Convention on Contracts for the International Sale of Goods (CISG).

(3) Exclusive place of jurisdiction for all disputes resulting directly or indirectly from the contractual relationship shall be Weiz or, at our discretion, the place where the customer has his headquarters.

(4) Collateral agreements, reservations, changes or amendments must be made in writing.

(5) Should individual clauses of these General Terms and Conditions of Trade be or become invalid, the remaining parts shall remain valid.

Should other provisions agreed upon in connection with the cooperation with the customer be or become invalid, the validity of all remaining provisions or agreements shall remain unaffected. In this event the parties shall be obliged to construe or to amend the invalid clause, so that the economic purpose of the invalid clause will be best achieved in a legally valid manner.

Valid: Septembre 2009 up to next version