Manual

iMetos ICA

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Table of Content

1 The iMETOS ICA 4
1.1 iMETOS ICA the irrigation control device 4
1.2 iMETOS ICA for soil moisture monitoring 4
2 Start-up the iMETOS ICA 5
2.1 Connecting the valves and the pressure switches 5
2.2 Using a PC or notebook connection to support the configuration of the iMETOS ICA 6
2.3 Switching valves using the VLV command 7
2.4 Setting up the schedule table 8
2.5 Setting the pulse wide for the solenoid valves 9
3 Use your iMETOS on http:// fieldclimate.com 10
3.1 Register yourself as a user on FieldClimate.Com 10
3.2 Add the iMETOS to your account 10
3.3 The iMETOS Menu 11
3.4 Settings for your iMETOS 12
3.5 Giving names to the iMETOS 12
3.6 Setting the Configuration of a iMETOS 13
3.7 Defining the iMETOS Location 13
3.8 Defining the Irrigation Shedule 14
3.9 Design the irrigation System on FieldClimate.Com 15
3.10 Irrigation Suppression 15
4 Installing the iMETOS ICA 16
4.1 Mounting the solar panel. 16
4.2 Mounting the iMETOS ICA on a pole 16
5 Installing the soil moisture sensors 16
5.1 Watermark Sensors 16
5.2 ECH_2O sensors 17
5.3 Joining Soil moisture and Water Tension 18
5.4 Tensiometer 18
6 Maintaining the iMETOS 18
7 Uninstalling 18
General Terms and Conditions of Trade 20

1 The iMETOS ICA

Thank you for choosing an iMETOS for monitoring and control ofsoil moisture and irrigation. The iMETOS ICA is created to control 3 to 6 valves or 1 to 2 pumps and 4 or 5 valves plus soil moisture on several sites.. Like all products of the iMETOS familie it is the field part of an internet based ystsm. It gets it irrigation schedule for the web server and it measures, logs and sends the data to the internet. iMETOS ICA systems will be mainly used for:

- To control micro irrigation set ups ind horticulture, gardening, public green and home gardens.
- To make a soil moisture dependent irrigation.

1.1 iMETOS ICA the irrigation control device

It is designed to control solenoid valves. Solenoid valves are switched by their own water pressure. Only short electric pulses are needed to control tis type of valves. By default iMETOS ICA switches with pulses of 300 ms length. The pulse to open and the pulse to close do have reveres polarity. The system can have entries for 3 or 6 valves. An iMETOS ICA for 3 valves can be expanded for 6 valves later too.

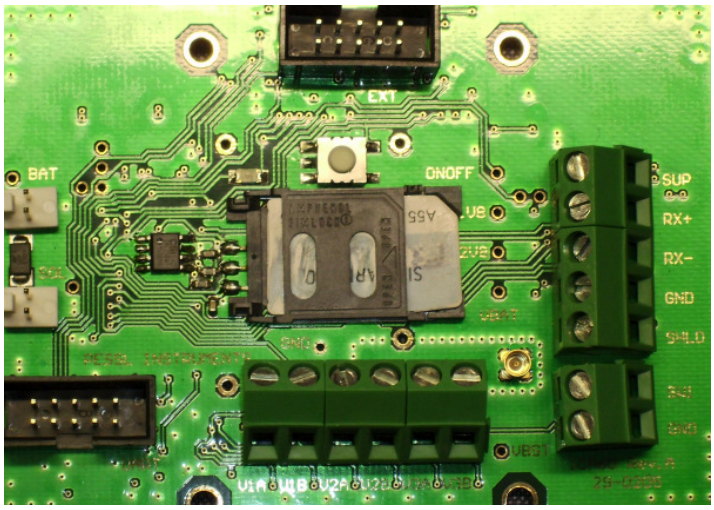
Solenoid valves do need water pressure to switch. In case there is no water pressure available it can not switch. This makes it helpful for a remote control system to check the incoming water pressure. A system for 3 valves has one input for a pressure switch, a system for 6 valves has to inputs to monitor a pressure switch.

1.2 iMETOS ICA 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 Irrometer.

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.

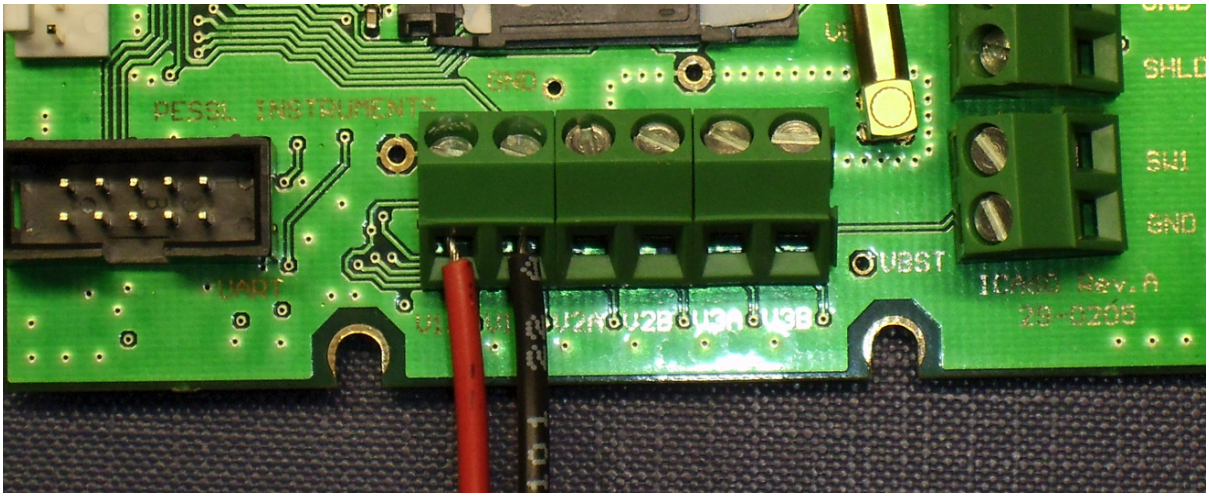
2 Start-up the iMETOS ICA



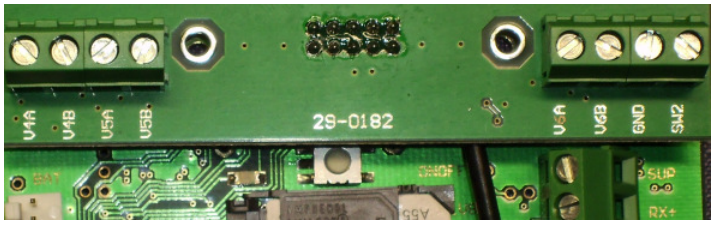
To start up the iMETOS you will need a valid GSM contract with the possibility to send at least 5MB data on GPRS per month and with the ability to send and receive SMS-messages. This contract has to be activated up front. Please make sure that the PIN code of the SIM-card is deactivated. To deactivate 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 to 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 send by any type of parcel service the power will be disconnected. Please connect the power after inserting the SIM card (BAT). Please check if the solar panel is connected as well (SOL).

2.1 Connecting the valves and the pressure switches



The first three valves have to be connected to V1A and V1B, V2A and V2B … When you check the polarity settings of the solonoid valves with a 9 V Battery block then A is the plus opening the vlave. If you are using Netafim valves this will be the red wire. If a pressure switch is used it will be connected to SW1 and GND on the right side of the PCB.



The valve 4 to 6 are connected on the extension PCB which sits on top of the main PCB. Here the connectors for V1A and V1B, V2A… and for GND and SW2 are placed. Independet if you are using SW1 or SW2 or both, you can

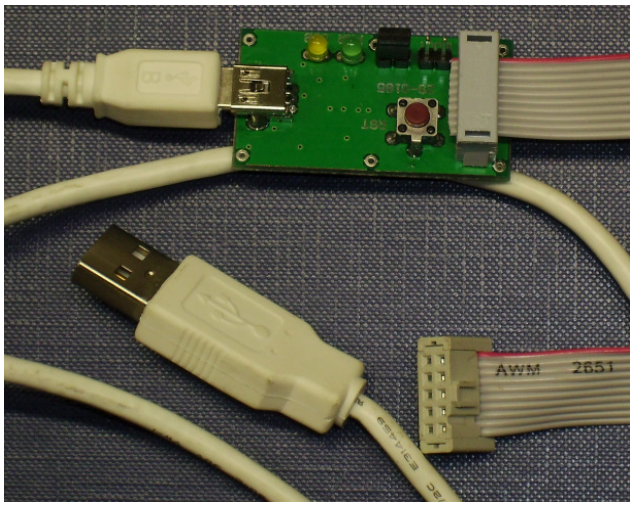
define the relation in between this inputs for pressure switches and the vlalves in FieldClimate.Com. But it is not possible to make the switching of the vlaves depending on both pressure swichtes.

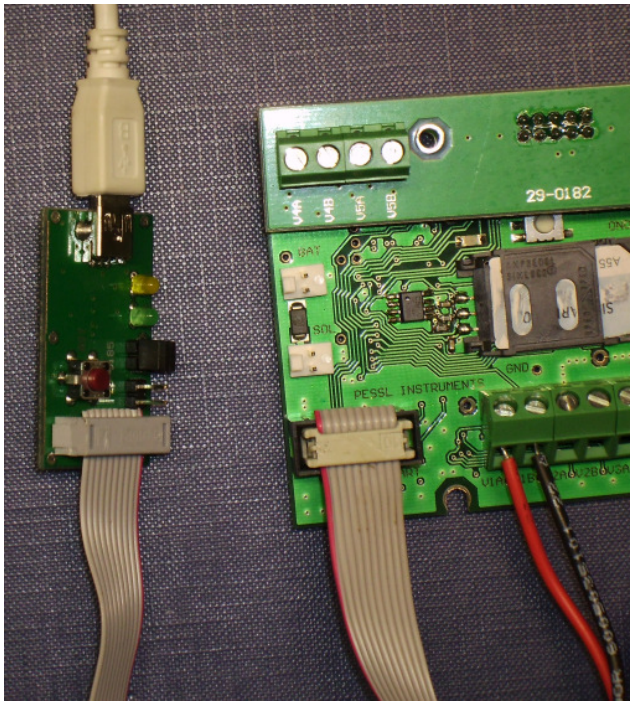
The input of the pressure switch is reported in the internet. Tehrefore the swiches can be used to monitor the water pressure before the valves and or the water pressure after the valves to monitor the operation of the irrigation.

If the power is connected press the little white bottom above the SIM-card to initialise an internet connection. 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.

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 screw and tide them carefully.

2.2 Using a PC or notebook connection to support the configuration of the iMETOS ICA





Pessl Instruments GmbH can deliver you with a USB cable which allows you to connect with the iMETOS ICA. This enables you to test the configuration and to do some specific settings if needed. To work with this cable you need a windows PC or notebook and some software installed on this. The cable connects to the USB port of the PC and it needs a specific driver to be used. The driver for the FTR232 you will find as a self installing executable under http://www.ftdichip.com/Drivers/CDM/CDM20814_Setup.exe This program should install the need driver. If this is complete it will create a new virtual com port on your PC. Beside of this you will need a terminal program. In windows XP and older version you will have hyper terminal installed. If you are using Vista or windows 7 we suggest to install TeraTerm. TeraTerm is a freeware terminal program which can be downloaded form http://en.sourceforge.jp/projects/ttssh2/downloads/53081/teraterm-4.71.exe/ This download site will install more programs in the same. Therefore cancel all after TeraTerm is installed successfully.

After you installed TeraTerm in the first start you have to select that you like to use it for serial communication and not for TCP/IP connections. To use it with iMETOS ICA you have to find out to which com port the serial cable has connected. To find this:

1. open TeraTerm without the serial cable being connected
2. go to the menu setup and select serial port
3. check the list of available serial ports in the drop down list.
4. close this window by cancel
5. connect the serial cable with the PC
6. open the settings serial port menu again
7. check the drop down list for one serial port more and use this serial port
8. use it with 115200 baud, 8 bit, non parity, 1 stop bit and none flow control
9. make sure that the jumper on the USB cable is on position “on”
10. connect the serial cable to the button left 10 pin connector in the iMETOS ICA PCB like shown in the picture above

If the settings are correct and the serial cable is connected with your iMETOS ICA and the device is powered you should be able to talk with it.

Now the iMETOS ICA should write similar texts then the following on the terminal window:

```
INITIALIZATION... 101
OK
Search for op
SIM_FULL_INIT Home network
SERVER CONNECTION
OPENED WROTE 2351 BYTES
BYTES READ 0 LOST 0
SERVER CONNECTION CLOSED,
BYTES WRITTEN 2351 READ 0
UPLOAD SUCCESSFUL
AT+CCLK="11/08/09,09:56:20"
IDLE WHILE ON INPUT ACTIVE...
```

After removing the ON jumper on the USB cable adapter, the module should start working according the schedule, which should look like this:

```
SCHEDULING... 10:13:30 SCHA NX=10:15:00=90s OFF1
```

2.3 Switching valves using the VLV command

The VLV command can be used to take over the control from the scheduling process and switch the valves directly into a fixed state. The valve remains in that state until it is switched to opposite state either by another VLV command or by the scheduling process (which has got back the control over the valve by issuing VLV=…,SCH command).

Set some of the valves to fixed-on state

User input: `AT+VLV=V1V2V5,ON`
Response: `OK`

Set some of the valves to fixed-off state:

User input: `AT+VLV=V2V4V6,OFF`
Response: `OK`

Return the control over some valves to the scheduling process:

User input: `AT+VLV=V5V3V1,SCH`
Response: `OK`

Query the current state of valves:

User input: `AT+VLV?`

Response example:

```
VALVE1 FIX ON
VALVE2 FIX ON
VALVE3 FIX OFF
VALVE4 FIX OFF
VALVE5 SCH ON
VALVE6 SCH OFF
OK
```

2.4 Setting up the schedule table

If the iMETOS ICA has to switch the valves according a schedule table it does this on base of its date and time settings. The date and time setting is taken form FieldClimate.Com on base of the time zone settings made by the user. With the CCLK command it is possible to check the time setting.

Query the RTC time:

User input: `AT+CCLK?`

Response example: `+CCLK: "09/09/02,14:19:59"`
`OK`

The tool for setting up the schedule table is the SCH command. With this command the user can add and delete entries, display the schedule table, save it into permanent memory and install a predefined demo schedule table. Here is the syntax of the SCH command:

List the content of the schedule table

User input:

`AT+SCH?`

or `AT+SCH=lst`

Response example:

```
IX YR/MT/DY HR:MN REPEAT  ACTION_TYPE
00 00/01/01 00:01 000006M VALVE_SW V1 FOR 1M
01 00/01/01 00:02 000006M VALVE_SW V2 FOR 1M
02 00/01/01 00:03 000006M VALVE_SW V3 FOR 1M
03 00/01/01 00:04 000006M VALVE_SW V4 FOR 1M
04 00/01/01 00:05 000006M VALVE_SW V5 FOR 1M
05 00/01/01 00:06 000006M VALVE_SW V6 FOR 1M
```

or `No active entries in the schedule table.`

Add an entry to the schedule table

In the case of ICA controller, the schedule table entry is a record which contains the following information:

1. **Action type** - In the current version (v0.33) only valve switching type of action is implemented. In the future versions it is planned to use also measurement and communication related types.

2. **Action parameters** - The valve switching action type has two parameters. One (V parameter), determines which valves should be switched on. The second (F parameter), is the time in minutes for which the valve(s) should stay switched on.

3. **Time** at which the action should be performed for the first time - This parameter is determined by date (D parameter) and time (T parameter). The date parameter uses the Year/Month/Day format, the time 24 hour format. For repeated actions, it does not have to be necessarily a future time in the moment of adding the entry to the schedule table. It can be also past time and the repetitions belonging to the future will be performed. However, one time action with this parameter in the past will never be performed.

4. **Repetition** time period (R parameter), at which the action should be repeated. If it is set to zero, the action is planned to be performed only once, without repetition. For valve switching action, the R parameter must be greater than the F parameter.

The following example shows the addition of a schedule table entry, that: switches valves 1,2,5, on 3.September 2009, at 6:00 AM, for 30 minutes, repeated every 1440 (60x24) minutes.

User input example:

```
AT+SCH=add,sw,v1v2v5,d09/09/03,t06:00,f30,r1440
```

Response example:

```
OK
```

Delete an entry from schedule table

The command's second parameter is the schedule table entry index, which appears at the beginning of each entry when the table is listed using AT+SCH? command. It is possible to delete all entries in the table when "all" is used instead of the entry index.

User input example:

```
AT+SCH=del,0
```

Response example:

```
Entry 0 has been deleted
OK
```

Save the schedule table into permanent memory

User input example:

```
AT+SCH=save
```

Response example:

```
The schedule table has been stored into permanent memory.
OK
```

Temporarily install a predefined demo schedule table

Two predefined schedule tables are implemented in the current software version. The table 1 switches one valve at a time, while the others are switched off. The on-time of each valve is one minute. The table 2 switches periodically all valves on for one minute, then all valves off for one minute.

User input example:

```
AT+SCH=pred,1
```

Response example:

```
Predefined table 1 has been temporarily installed.
OK
```

2.5 Setting the pulse wide for the solenoid valves

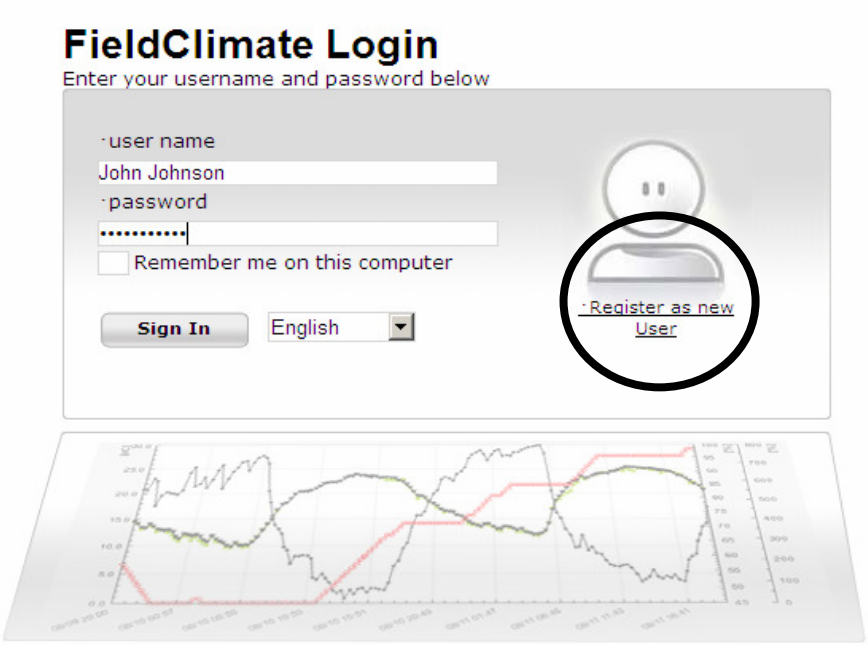
iMETOS ICA is preconfigured for the use with NETAFIM solenoid valves. Different valves might need a different length of the switching pulse. This can be set in serial communication in the terminal mode by the command at-swo=pwd,n. Where "n" stands for the pulse length in milliseconds. This settings are valid for all valves.

3 Use your iMETOS on http:// fieldclimate.com

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

3.1 Register yourself as a user on FieldClimate.Com

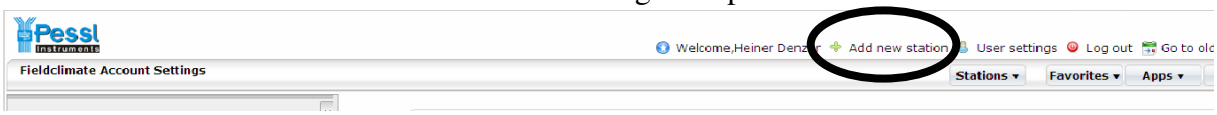
To use the services on FieldClimate.Com it is needed to register as a user for this. Please press the link with you see surrounded by the circle on the graph beside.



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 send to your inbox and its containing link has to be used to activate the newly created user account on FieldClimate.Com.

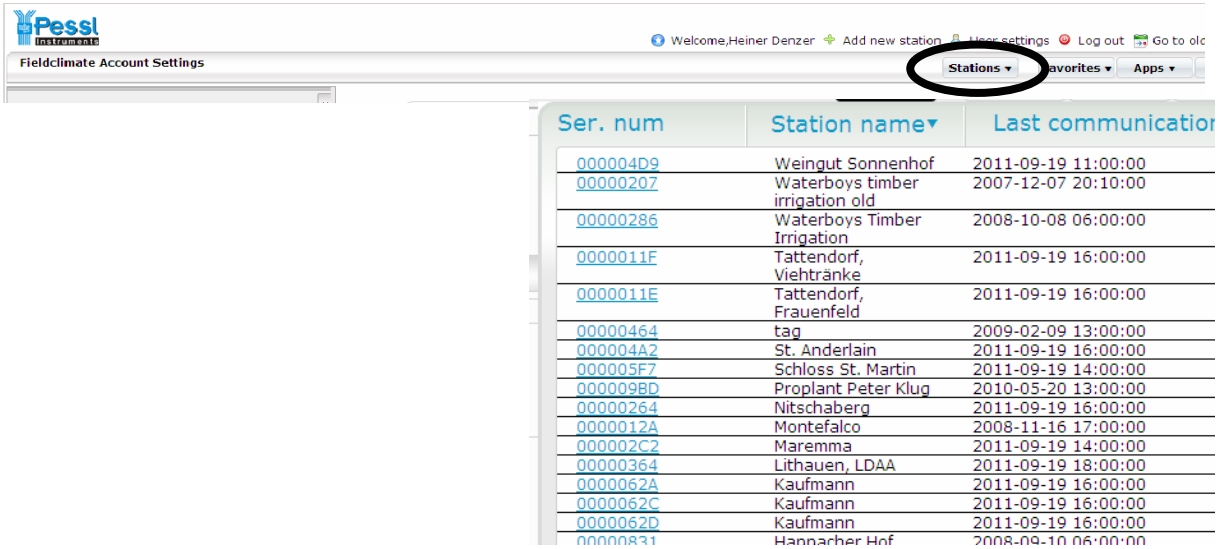
3.2 Add the iMETOS to your account

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.

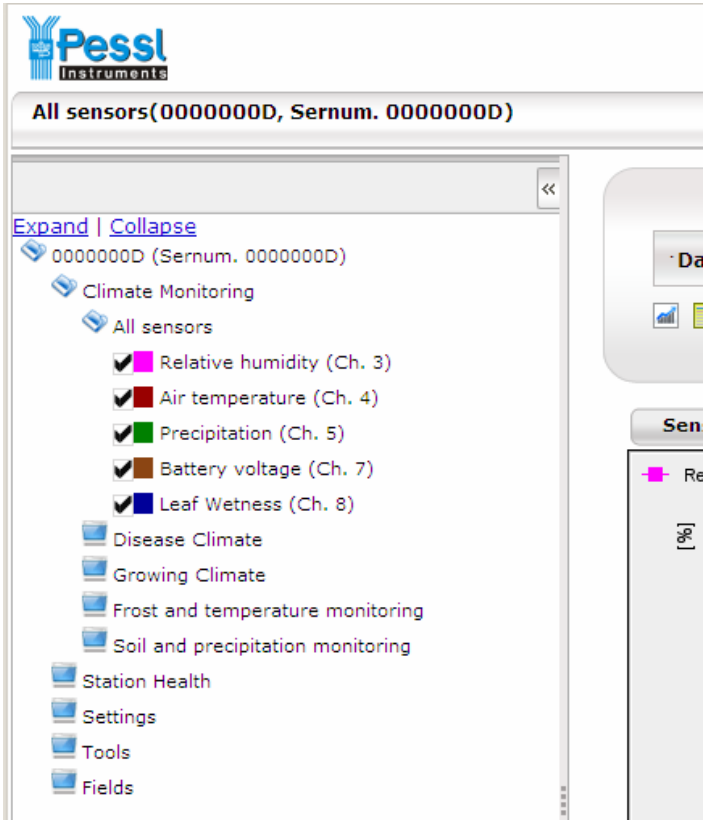


It will ask you for a serial number and a key. Now the little silver colored sticker which came with your iMEOS has to be used. This sticker contains two keys. Key 1 gives the power to change all the settings on the iMETOS whereas key 2 is only valid to use the data of the system. To be able to set up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

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.



3.3 The iMETOS Menu

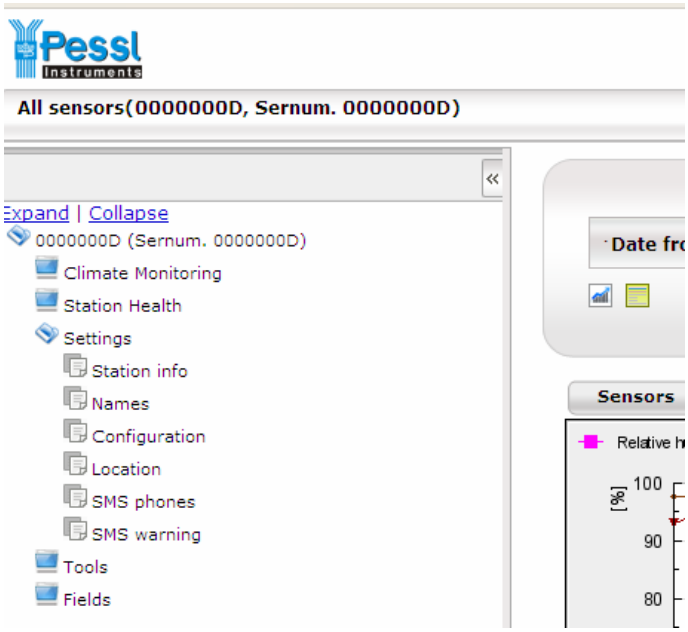


When you selected a iMETOS and the site has reloaded the menu visible on the left side of the screen is valid for the selected iMETOS. The menu starts with the gibven name and serial number of the station. Pessl Instruments tried to structure the menu following the frequency you will need the different 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 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

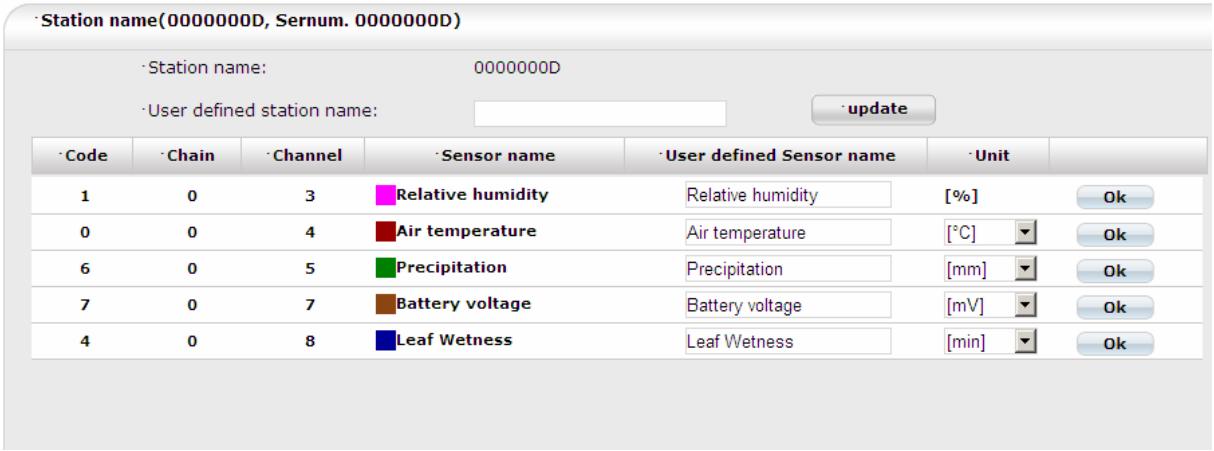


The settings menu starts with the link "**Station info**"which displays you information about the name, type and software of the iMETOS. It shows you the GPS position which has been set for this station. It lists the duration of the data recorded on FieldClimate.Com for this station. From this screen 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

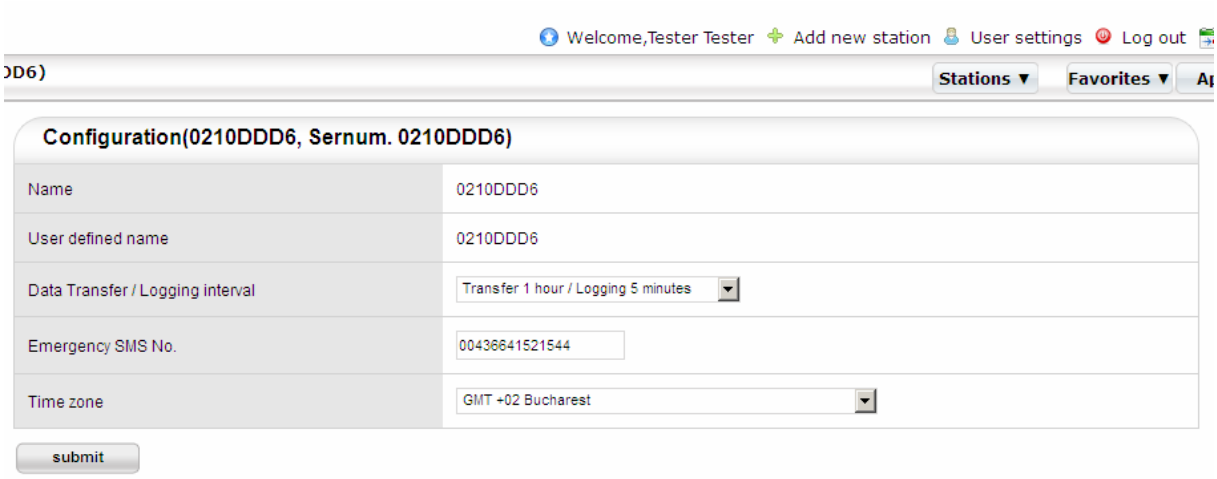
Every iMETOS is significant named by a serial number. For the most users it is more convenient to name it after the site it is installed. Tehrefore the names screen offers the possibility to enter a given name.



Code	Chain	Channel	Sensor name	User defined Sensor name	Unit	
1	0	3	Relative humidity	Relative humidity	[%]	Ok
0	0	4	Air temperature	Air temperature	[°C]	Ok
6	0	5	Precipitation	Precipitation	[mm]	Ok
7	0	7	Battery voltage	Battery voltage	[mV]	Ok
4	0	8	Leaf Wetness	Leaf Wetness	[min]	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 Emmergency SMS number is used to send SMS on missed pressure, low battery and random failure too. The setting for logging interval and transmission times will work with the default values as long it is not changed. The logging interval is set to 5 minutes by defaultit can be changed to 20 minutes. The upload interval can be changed form 1 hour to 8 hours. Longer logging interval will reduce the costs but will reduce resolution of the reported information. The settings are send to the web server by pressing the "**submit**" link.

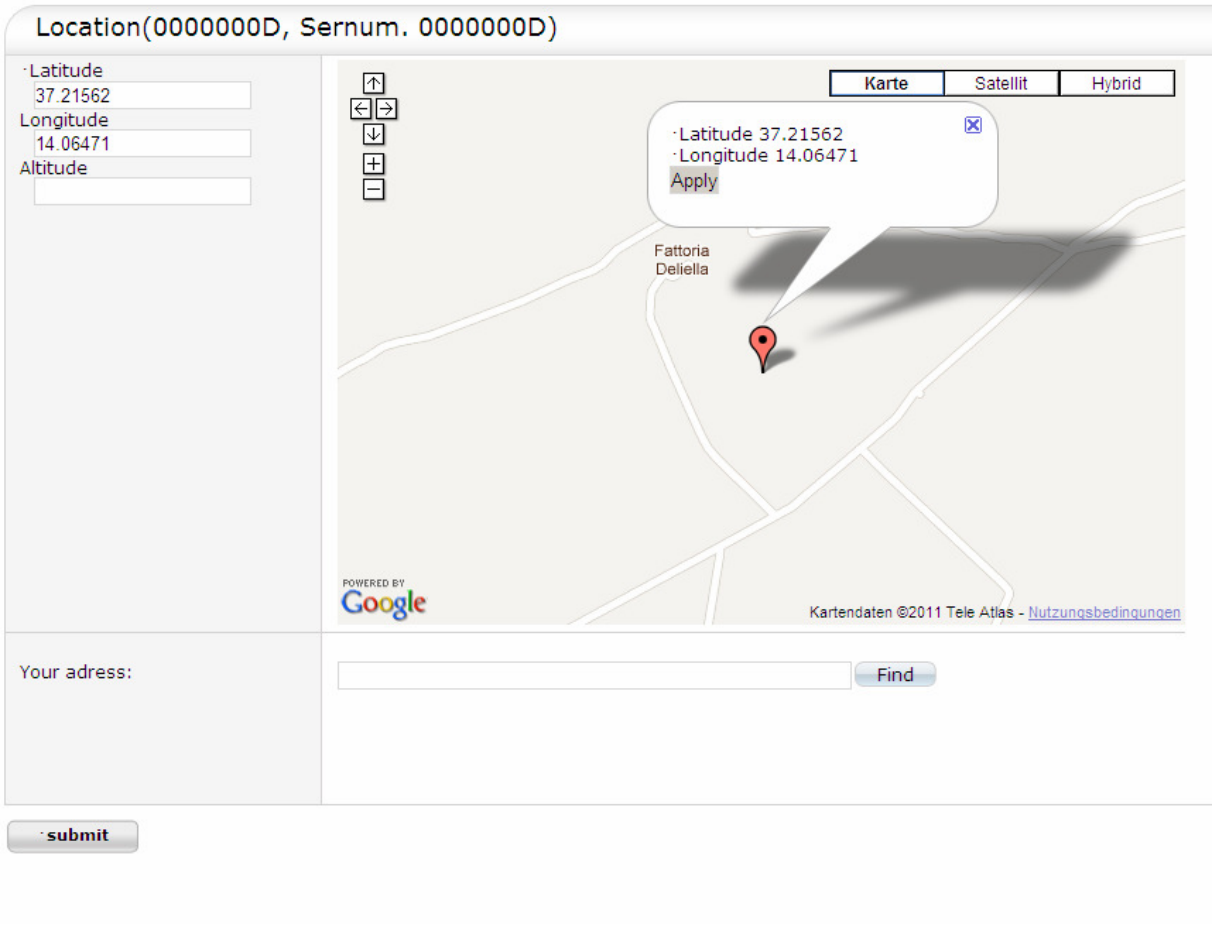
3.7 Defining the iMETOS Location

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.

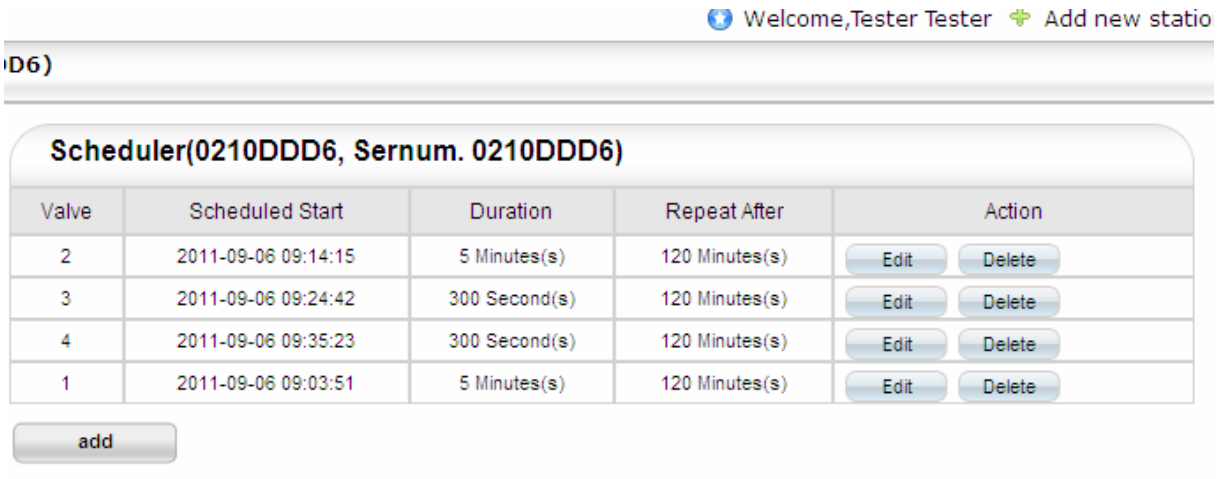
To define the location a map service is used in which you can select the map or the satellite view. If you enter the address where the iMETOS is installed the correct part of the map will be opened. The zoom + and – allows you to zoom inot the map and you can set the iMetos very accurate in its real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

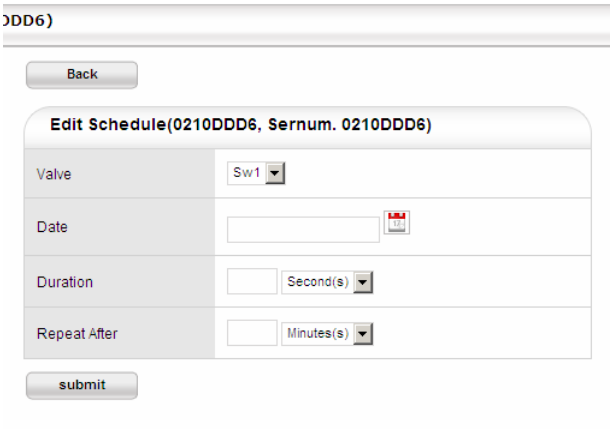


3.8 Defining the Irrigation Shedule



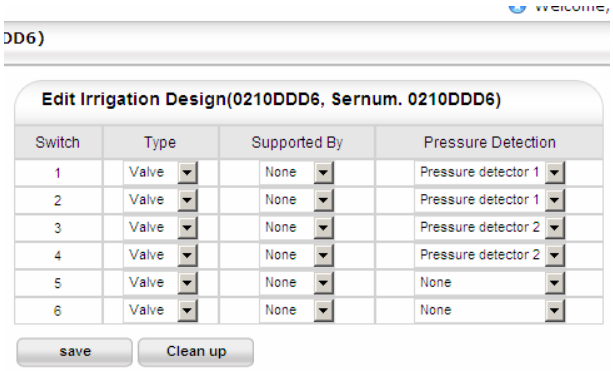
The iMETOS ICA is an internet based irrigation controller. It can be programmed by 36 statements describing the vale, the opening time, the duration and the repeat time of an irrigation program. This means several description can be done for one valve. This is needd when valves will not be opened at a fixed repeating time. Per example on public green main irrigation is done in the evening hours, a short irrigation in the early morning and at noon should be done too to conserve a fresh look. In this case three statements for one valve will be needed because the repetition is not regularly.

A new schedule is added by pressing the add button. A new screen will occure. Here we can define the valve with Sw1 to Sw6. The date and time when the irrigation regime should start. The duration the valve will be opened in seconds, minutes or hours and the number of minutes, hours or days when it will be repeated. If the settings have been made the “submit” button transmits this information to the data base and a new statement can be made. With the link “back” we come to the screen before. Where a statement cn be edited or deleted with the “edit” or “delete” button. The “edit” gives the same screen like the “add” but already filled with the previous settings. Delete just deletes the entry.



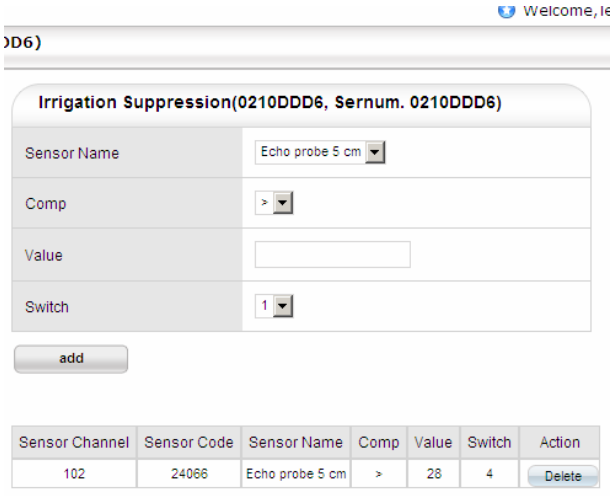
3.9 Design the irrigation System on FieldClimate.Com

The switches of the iMETOS ICA can be connected to solenoid valves, what will be the more common task for them. But they might be used to switch on irrigation pumps too. In this cae the irrigation pump will be responsible for all the following vales or for a part of the vlaves connected to the iMETOS ICA. This has to influence the behaviour. iMETOS ICA has to ensure that the pump is switched on and will bring pressure before the valves ar eopened. This dependences are defined on this screen.



3.10 Irrigation Suppression

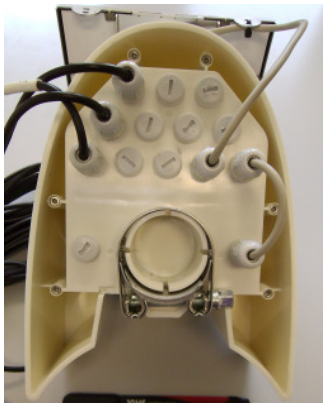
iMETOS ICA can use soil moisture sensors. This sensors can be used to suppress an scheduled irrigation if the water contend is too high or the water tension is to low. For this a sensor name and the operator (smaller or larger) has to be selected and a threshold has to be entered. The switch on which this should be active has to be selected too.



4 Installing the iMETOS ICA

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 clamb for the pole sits below it. The solar panel is hanging on a short cable.

4.1 Mounting the solar panel.

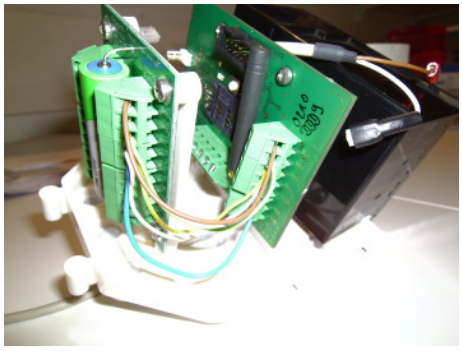


The solar panel is connected with the main body by a short cable. It is packed in plastic film to be protected form transportation damage. Please unpack it and insert its legs into the two cuts at the top of the iMETOS.

4.2 Mounting the iMETOS ICA on a pole

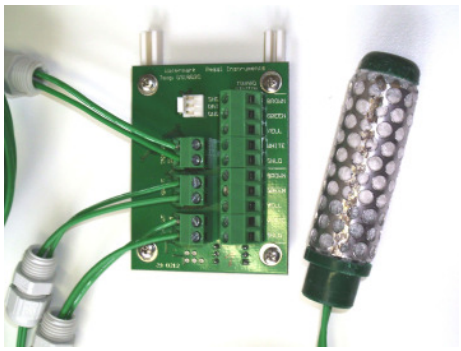
At the bottom of the unit there is a plastic ring with a metal clamp on. This fits on a 33 mm pole. Please hammer a pole of 1.2 to 2m straight into the ground and set the iMETOS eco d2 on it. The solar panel should be directed towards the sun (South on northern hemisphere and North on southern hemisphere).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

5 Installing the soil moisture sensors



iMETOS ICA is designed to monitor soil moisture at the crop and to present this data on FieldClimate.Com too. The GPRS or EDGE networks are allowing you to install the device wherever you need it. iMETOS ICA might be used to switch irrigation and 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 this 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 this other sites will have their own sensor evaluation PCBs in 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 this sensor evaluation PCBs can be linked together in a chain.

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.

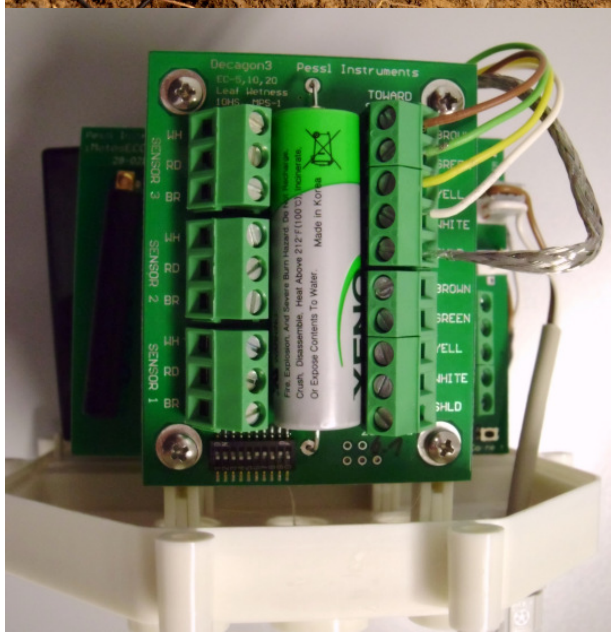
Basically it is a gypsum block. The gypsum is embedded in a matrix material. And it gives a defined response in resistance on different water tension levels. We can measure the water tension on 3 to 5 cBar accuracy.

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 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 ECH_2O 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. 10HS 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.

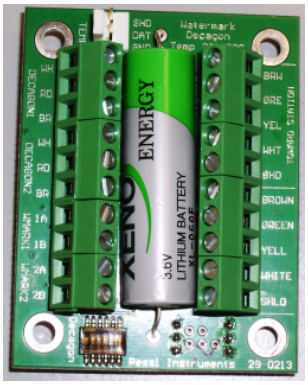


As soon as you have structured organic matter or stones in the soil this way of installation is not possible. In this case you will have to dig a trench and to make smaller holes with the different depths you like to install the sensors. Take some of the soil of the different holes and mix it carefully 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 ECH_2O 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. Nevertheles 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. This 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 ECH_2O probes and a soil temperature.

5.4 Tensiometer

Pessl Instruments is delivering tensiomers of different length form Irrometer LTD. For this tensiometer we deliver screw in pressure adapter. 4 of this 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 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 form 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.

7 Uninstalling

iMETOS ICA is mainly used for preserving and monitoring soil moisture. If this is in a permanent crop in a climate without frost, 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 or there might be frost and the irrigation system has to be dismounted. 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 month 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 Austrian 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 dept 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 on 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 advice 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 advice 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 perform-ance 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