

# METEOROLOGICAL MEASUREMENT NETWORKS FOR AGRICULTURE AND HORTICULTURE

## Pest Management / Frost Warning Irrigation / Environment Monitoring

Micro-climate weather stations as stand-alone  
or network solutions



Integrated disease models

Real-time data transmission

Data visualization via PC or Internet

Automatic interface for further evaluation  
of measurement data using other software



Database concept with extension option (forecasts)



ZERTIFIZIERT  
DIN EN ISO 9001  
NR 70100 F 222  
CERTIFIE

G. LUFFT MESS- UND  
REGELTECHNIK GMBH

POSTFACH 4252  
70719 FELLBACH  
TEL. 49 (711) - 51822-0  
FAX 49 (711) - 51822-41  
Internet: <http://www.lufft.de>  
e-mail: [info@lufft.de](mailto:info@lufft.de)



# The Total System

**Collector and Database / Visualization /  
Model Calculation / External Software**



**Collector Software**

**MYSQL**

Measurement Data, disease models,  
calculations, forecasts...

**SmartCom  
Communications  
module**

**Further evaluation using  
external software**

**Warning  
alarm**

**Model  
calculation**

FTP / export

Scab, pero, oidium,  
botrytis import

**SmartView3  
Configuration  
parameterization**

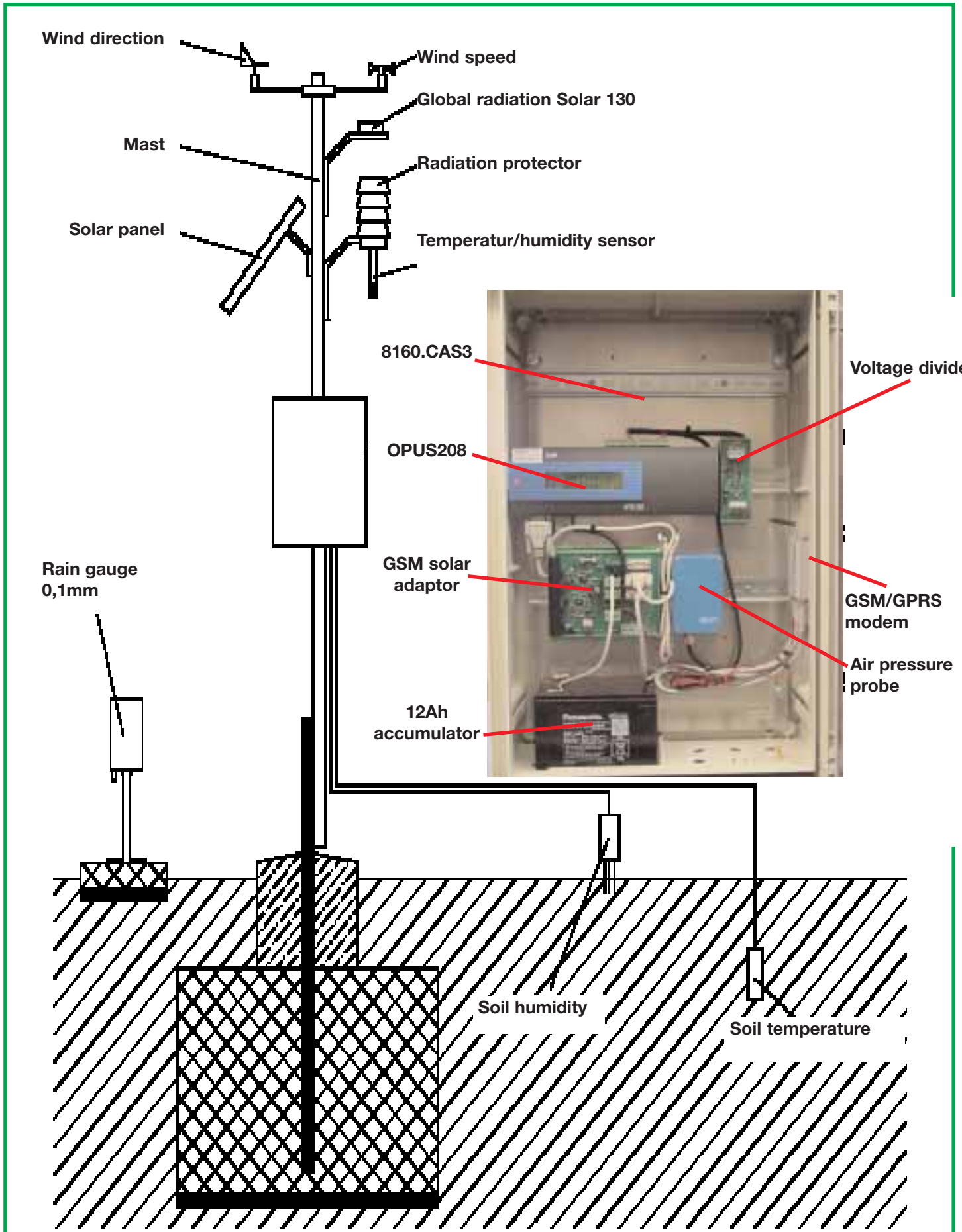
**SmartWeb  
visualization  
(html)**

**Weather  
service**

Forecasting data

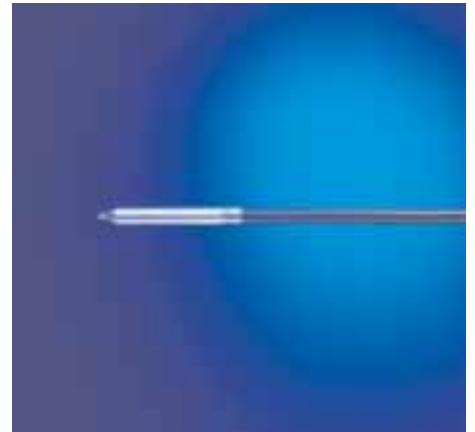
**Charts**

# Hardware Construction Opus200 / Opus208 Weather Station



# Sensors: Air temperature, relative humidity, soil temperature, leaf wetness

Technical data	Ref. No.
Temperatur probe for OPUS200 (i) / 300 (i) / 208	<b>8160.TF</b>
Dimensions	Length 50mm, Ø 6mm
Output signal	Resistance
Weight	370g
Cable length	10m
Protection type	IP68
Connector	COMBICON Phoenix, gold contact
Operating temperature	-50...150°C
Operating rel. humidity	0...100% RH
<b>Temperature</b>	
Principle	Pt100
Measuring range	-50...150 °C
Accuracy	±0,2°C (-30...70°C), otherwise ±0,4°C, + 1 digit
<b>Application</b>	
	<b>Soil temperature measurement</b>



Technical data	Ref. No.
T/r.h.-probe for OPUS200 (i) / 300 (i) / 208	<b>8160.TFF10, 10m cable</b>
T/r.h.-probe for OPUS200 (i) / 300 (i) / 208	<b>8160.TFF50, 50m cable</b>
Dimensions	Length 185mm, Ø 16mm
Output signal	Resistance, frequency
Operating voltage	6...15V
Operating current	Approx. 10mA
Weight	400g
Protection type	IP54
Connector	COMBICON Phoenix, gold contact
Operating temperature / Operating rel. humidity	-30...70°C / 0...100% RH
<b>Relative humidity</b>	
Principle	Capacitive
Measuring range	0...100 % RH./ accuracy ±2% RH
<b>Temperature</b>	
Principle	Pt1000
Measuring range	-30...70 °C / accuracy ±0,2°C
<b>Application</b>	
	<b>Air temperature and relative humidity measurement</b>



Accessories	Ref. No.
Radiation shield	<b>8150.SCHU</b>

Technical data	Ref. No.
Leaf wetness sensor for OPUS 200/300/208	<b>8359.02</b>
Data collection as analogue value	0...65: wet
	66...150: dew
	151...255: dry
Protection type	IP54
Operating temperature	-20...50°C
<b>Leaf wetness</b>	
Measuring range	0 ... 255
<b>Application</b>	
	<b>"In-crop" leaf wetness measurement</b>

Accessories	Ref. No.
Electrode paper	<b>0080.55</b>
2nd leaf wetness sensor, connected in series (Measurement "within and outside the crop")	<b>8342.BNASS</b>



# Sensors: Precipitation quantity with various resolutions, pyranometer (brightness)

Technical data	Ref. No.
Rain gauge 1mm, unheated, for OPUS 200(i)/300(i)/208	<b>8353.05</b>
Dimensions	100x50mm, height 100mm
Connection type	Open cable ends
Collecting area	50cm <sup>2</sup>
Resolution	1 mm (tipping bucket)
Weight	300g
Mounting type	On mast, Ø 50mm
Weight	7,5kg
Operating temperature	-20...60°C
<b>Application</b>	<b>Cumulative precipitation measurement, with heating, resolution 1 mm</b>



Technical data	Ref. No.
Rain gauge 0,2mm, unheated, for OPUS 200(i)/300(i)/208	<b>8353.04</b>
Dimensions	Ø165mm, height 255mm
Connection type	Open cable ends
Collecting area	200cm <sup>2</sup>
Resolution	0.2mm (tipping bucket)
Weight	380g
Mounting type	On mast, Ø 50mm
Operating temperature	-20...60°C
<b>Application</b>	<b>Cumulative precipitation measurement, with heating, resolution 0.2 mm</b>



Technical data	Ref. No.
Rain gauge 0,1mm, heated for OPUS 200(i)/300(i)/208	<b>8353.01</b>
Dimensions	Ø 225mm, height 480mm
Connection type for 8353.01/8353.02	Open cable ends
Collecting area	200cm <sup>2</sup>
Resolution	0.1mm (tipping bucket)
Weight	7.5kg
Heating	24 VDC/AC, 55W
Mounting type	On mast, Ø 50mm
Operating temperature	-20...60°C
Rain gauge 0,1mm unheated for OPUS 200(i)/300(i)/208	<b>8353.02</b>
<b>Application</b>	<b>Cumulative precipitation measurement, with or without heating, resolution 0.1 mm</b>
Accessories	Ref. No.
Power supply for heated probes for 8353.01	<b>8161.SV4</b>
Stand, height 1m	<b>8353.FUS</b>



Technical data	Ref. No.
Pyranometer SOLAR 130, 5m cable, for OPUS 200(i)/300(i)/208	<b>8346.00</b>
Dimensions	Ø 83mm
Construction	Housing aluminium anodised
Output signal	100mV at 1000W/m <sup>2</sup>
Weight	226g
Impedence	250...400
Cable length	5m
Containing	1 probe with cable
Directional characteristic	cos z
Protection type	IP65
Spectral range	0.4...1.05µm
Operating temperature	-40...70°C
<b>Radiation</b>	
Principle	Silicon cell
Measuring range	0...1500 W/m <sup>2</sup>
Accuracy	±1% of full scale
<b>Application</b>	<b>Day/night differentiation</b>



# Sensor: Wind direction and wind speed, soil humidity

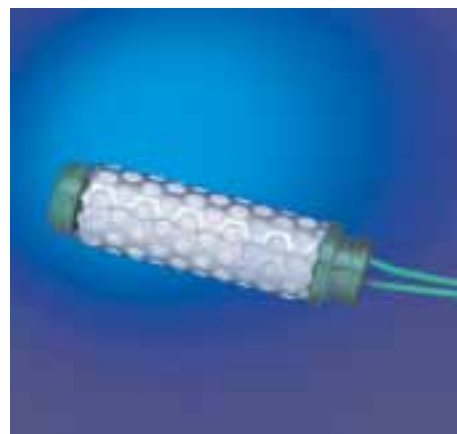
Technical data	Ref. No.
Wind sensor for OPUS 200(i)/300(i)/208	<b>8368.03</b>
Dimensions	165x115mm
Start-up value	0.9 m/s
Connection type	Open cable ends
Weight	500g
Cable length	10m
Protection type	IP54
Operating temperature	-30...70°C
<b>Wind speed</b>	
Principle	Generator
Measuring range	0,9...50 m/s



Technical data	Ref. No.
Windsensor for OPUS 200(i)/300(i)/208	<b>8368.01</b>
Dimensions	Traverse 1m
Start-up value	0.9 m/s
Connection type	Open cable ends
Weight	2.5kg
Cable length	10m
Protection type	IP65
Wind direction	2° open at south
Operating temperature	-30...70°C
<b>Wind speed</b>	
Principle	Generator
Measuring range	0,9...50 m/s
<b>Wind direction</b>	
Principle	Potentiometer
Measuring range	0...358 °
Wind sensor heated, techn. data like 8368.01	<b>8368.06</b>
Heating	40W, 24VDC/AC



Technical data	Ref. No.
Soil humidity sensor for OPUS 200/300/208	<b>8358.01</b>
Dimensions	Length 65mm, Ø 23mm
Output signal	500 ...30Hz
Operating voltage	1VAC
Cable length	10m
Operating temperature	-10...40°C
<b>Soil moisture</b>	
Principle	Resistance
Measuring range	0...200 cbar
<b>Application</b>	
	<b>Soil humidity measurement for irrigation decision-making</b>



Technical data	Ref. No.
Soil humidity sensor for OPUS 200/300/208	<b>8358.02</b>
Dimensions	Length 230mm, Ø 63mm
Output signal	4...20 mA
Operating voltage	7...15 V DC
Cable length	5m (special length on enquiry)
Operating temperature limits	-15...50°C (others on enquiry)
<b>Soil humidity</b>	
Principle	TDR (Time Domain Reflectometry)
Measurement range	0...100% vol. soil humidity content
<b>Application</b>	
	<b>High-precision, long-term stable soil humidity measurement for irrigation decision-making</b>
	<b>For mains operation only!</b>



# The Data Collector

## OPUS208 - 8 to 240 Channel Datalogger, modular technology

8 channel datalogger/transmitter with the following characteristics:

- Universal connection options for all types of industrial sensor
- High accuracy
- CAN-Bus networking with up to 30 additional modules
- Extendable with OPUS 200/300 modules

Reliable measurement systems pick up signals close to the sensor, to eliminate the effects of interference. The datalogger has a digital interface for further data processing.

The extendability and modularity guarantee the highest reliability and future upgrading to meet additional requirements.

Battery, mains or solar operation.

Technical data	Ref. No.
<b>Data logger OPUS 208</b>	<b>8162.00</b>
Dimensions	240x80x35mm
Measuring interval	1/10/30/60s, adjustable per channel
Alarm output	4 x open collector outputs (20mA/12V each up to a total of not more than 50mA)
Construction	Housing steel, lacquered
Data storage	60,000 measurements per channel
Display	2 lines, 16 characters readable down to -20°C
Weight	Approx. 800g
Storage temperature	-30...70°C
Interface	Serial RS232 with CTS and RTS 19.200 Baud
Protection type	IP42, with protection
Power supply	9...15VDC, nominal 12V, battery operation
Storage interval	1/10/30/60s, 1...1440min, adjustable per channel
Storage possibilities	Ave., min., max., any combination possible
Connecting system	COMBICON Phönix, gold contact
Power consumption active	<60mA
Power consumption stand-by	<1.5mA
Operating temperature	-30...60°C
Operating rel. humidity	0...95% RH (non-condensing)
<b>Frequency (only channel 1-6)</b>	
Measuring range	10...1000 Hz
<b>Impulses (only channel 1-6)</b>	
Measuring range	0...65000 impulses/recording interval
<b>Voltage</b>	
Measurement ranges	-20...20 mV, -40...40 mV, -0,1V...0,1V, 0...0,1 V
<b>Current</b>	
Measurement ranges	4...20 mA, 0...20 mA
<b>Thermocouple voltage</b>	
Measurement ranges	K, J, E, N, R, S
<b>Resistance</b>	<b>PT100, PT1000</b>
Measurement ranges	0...2k, 0...20k, 0...100k, 0...200k
<b>Accessories</b>	<b>Ref. No.</b>
COM-SERVER	<b>8156.SER</b>



Networking capability  
 Extendable with OPUS200/OPUS208  
 Highly flexible system accepts almost any type of sensor

# Datensammler

## OPUS200/300 - 2 to 300 Channel Datalogger, Modular Technology

2 channel datalogger and transmitter specially for applications in industry, with the following characteristics:

- Universal connection options for all types of industrial sensor
- High accuracy
- CAN-Bus networking with up to 150 additional modules

Technical Data	Ref. No.
<b>Data logger OPUS 200</b>	<b>8160.00</b>
<b>Data logger OPUS 300</b>	<b>8160.10</b>
Dimensions	160x50x45mm
Measuring interval	0.1/1/10/30/60s, selectable per channel
Alarm output	0,5 A/30V, 500.000 cycle per lifetime 0,3 A/30V, 1.000.000 cycles per lifetime, relay
Construction	Plastic housing
Data storage Max. 30,000 measurements/channel	
Display	2 lines, 8 characters down to -20°C readable
Weight	200g
Isolation voltage supply/input	500V max.
Storage temperature	-30...70°C
Interface	Serial RS232 with CTS and RTS 19.200 Baud
Protection type	IP42, with protection
Power supply	9...15VDC, nominal 12V, battery operation
Storage interval	0.1/1/10/30/60s, 1...1440min, selectable per channel
Storage possibilities	Ave., min., max., any combination possible
Connecting system	COMBICON Phoenix, gold contact
Power consumption active	<60mA
Power consumption stand-by	<1.5mA
Operating rel. humidity	0...95% RH
<b>Frequency</b>	
Measuring range	10...1000 Hz
<b>Impulses</b>	
Measuring range	0...65000 impulses/recording interval
<b>Voltage</b>	
Measuring range	-20...20 mV, -40...40 mV, -0,1V...0,1V, 0...0,1 V
<b>Current</b>	
Measuring ranges	4...20 mA, 0...20 mA
<b>Thermocouple voltage</b>	
Measuring ranges	K, J, E, N, R, S
<b>Resistance</b>	<b>PT100, PT1000</b>
Measuring ranges	0...2k, 0...20k, 0...100k, 0...200k
<b>Accessories</b>	<b>Ref. No.</b>
COM-SERVER	<b>8156.SER</b>

Modular design  
Extendable up to 300 channels  
CAN-Bus networking  
Central or on-site control



# Control Panel / Communication / Power Supply

## Data transmission via GSM radio modem

### RS232:

The OPUS208 datalogger has an **RS232** interface, as has each OPUS200.

Thus a data acquisition system has "n" **RS232** interfaces, corresponding to the number of logger modules.

### TCP/IP:

With the aid of the COM-server, part no. 8156.SER, the RS232 interface is made available via TCP/IP and can therefore be interrogated via a TCP/IP network.

(Measurement data acquisition via LAN = Local Area Network).

The Com-server converts the OPUS200/208 RS232 connection into a 10/100Base T-Ethernet connection.

### GSM/GPRS:

The GSM/GPRS modem with dual-band transmission and minimal power consumption is ideally suitable for the transmission of measurement data in the environmental sector.

The **GSM** modem 8160.GSM includes all the necessary cables for connection to the OPUS208/200 datalogger.

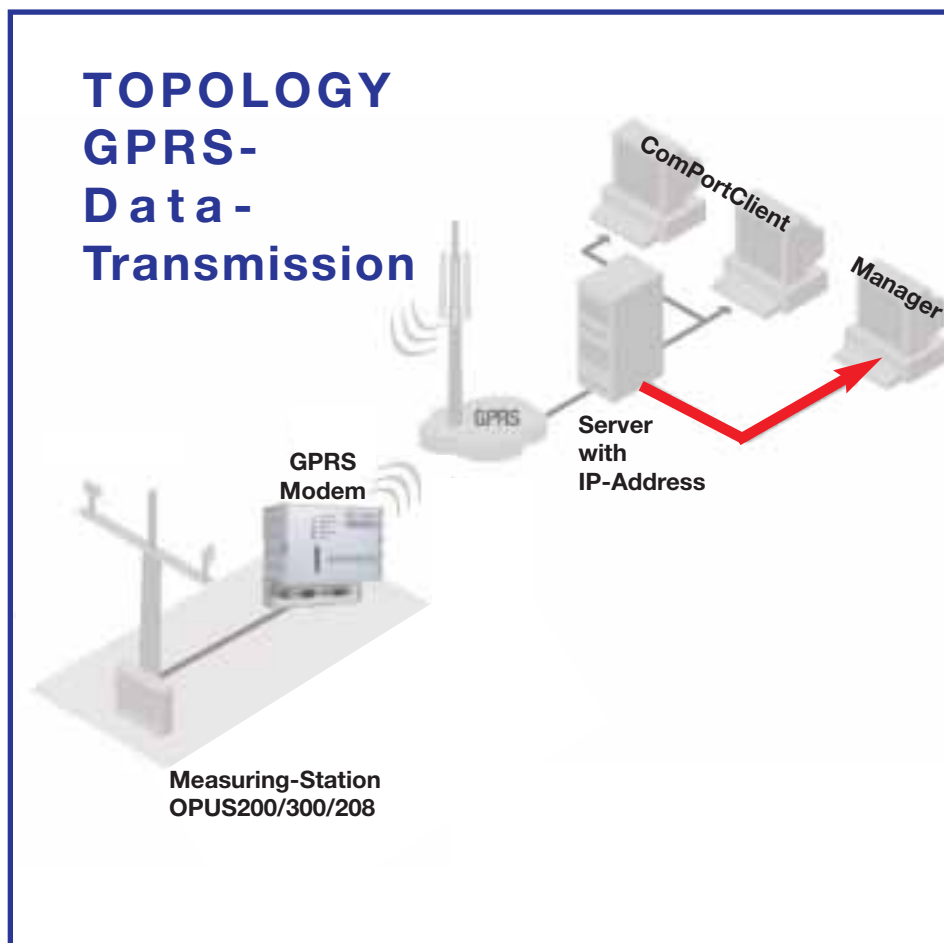
Data transmission via **GPRS** takes place via TCP/IP.

### CDMA:

A robust **CDMA** modem is available. This makes data transmission possible in countries where GSM is not available, by means of static IP addresses.

### Satellite (GOES/METEOSAT):

For satellite transmission, a transmitter is available to transfer the measurement data via geostationary meteorological satellites to the central data station.



# Software - the "Collector" base

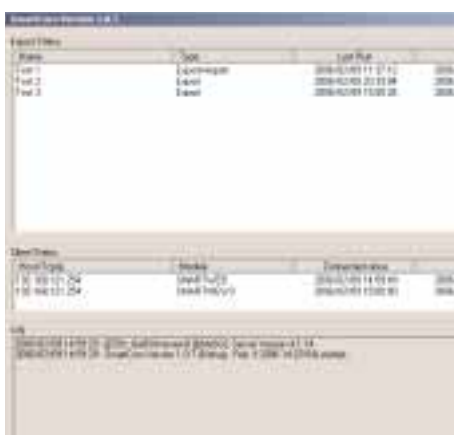
- Flexible polling
- Simultaneous interrogation of the measurement network via a number of communications connections
- Several collectors for 1 database ("parallel filling")

The Collector software allows polling of any desired number of measurement stations under Windows and stores the data in a MYSQL database.

The "ColConfig" module sets up the MYSQL database and parameterizes the stations to be interrogated by the Collector and their polling frequency.

**8160.COLLECT05**

**8160.COLLECT**



SmartWeb Version 1.0.7

Status

Generating Site 1 Page 7

Site Name	Page Title	Type	Page	Nr	Last Gene
SmartWeb	Map Page	map page	1		2006/02/09
SmartWeb	Stations	station list page	2		2006/02/09
SmartWeb	Data Pages	data list page	3		2006/02/09
SmartWeb	Archive	archive menu page	4		2006/02/09
SmartWeb	Imprecum	other page	5		2006/02/09
SmartWeb	Station 1	station page	6		2006/02/09
SmartWeb	Station IP	station page	7		2006/02/09
SmartWeb	Station 4	station page	12		2006/02/09
SmartWeb	Station 1	data page	13	14	2006/02/09
SmartWeb	Station 1	archive list page	14		2006/02/09
SmartWeb	Station 2	data page	15	14	2006/02/09
SmartWeb	Station 2	archive list page	16		2006/02/09
SmartWeb	Station 4	data page	17	0	2006/02/09
SmartWeb	Station 4	archive list page	18		2006/02/09

2006/02/09 14:57:59 - SmartWeb - Version 1.0.7 (Debug - Feb 9 2006 14:31:50) started

# SmartView3+SmartWeb Software "SmartCom and Visualization"

**Parameterizable graphics**  
**Tabular measurement data**  
**Automatic, flexible export**  
**Disease model calculation**  
**Warning/alarms**  
**Stand-alone version**  
**Internet data distribution**

The "Collector" basic package is required for SmartView3:

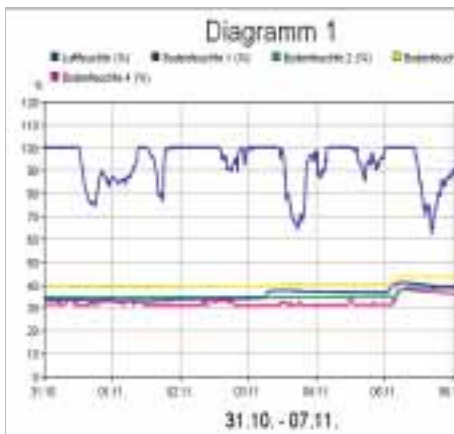
SmartView3 **8040.SV300**

SmartCom is the communications module, which communicates with SmartView3, for the presentation of measurement data, and with other external software (e.g. disease model calculations).

SmartView3 is a visualization package which enables the measurement data to be presented in graphic and numeric form via a browser.

SmartWeb generates complete web pages in the form of html files. The display parameters are pre-set so that the displays also build extremely quickly on the Internet.

Any desired sensor values (or calculated values from model calculations or forecasts) can be shown on the html pages, in the form of graphs, bar charts or tables. In addition, for each measurement station interrogated by Collector, a page is created with statistical information about the station. A camera image can also be produced. A summary page displays information about all the stations. The stations can be presented graphically on a map.



Datum	Uhrzeit	Lübbach 1 (I)	Lübbach 1 (II)	Lübbach 2 (I)	Lübbach 2 (II)	Lübbach 4 (I)
07.11.2006	00:00:00	7,55	83,07	10,4	9,1	9,1
07.11.2006	00:10:00	7,37	83,68	10,38	9,1	9,1
07.11.2006	00:20:00	6,82	85,52	10,3	9,1	9,1
07.11.2006	00:30:00	6,67	86,07	10,3	9,1	9,1
07.11.2006	00:40:00	6,91	85,95	10,45	9,85	9,85
07.11.2006	00:50:00	6,89	86,58	10,3	9	9
07.11.2006	01:00:00	6,6	87,28	10,3	9	9
07.11.2006	01:10:00	6,65	87,72	10,27	9	9
07.11.2006	01:20:00	6,45	87,99	10,2	8,82	8,82
07.11.2006	01:30:00	5,98	90,51	10,2	8,9	8,9
07.11.2006	01:40:00	4,81	83,62	10,21	8,89	8,89
07.11.2006	01:50:00	4,41	86,02	10,2	8,82	8,82
07.11.2006	02:00:00	4,29	86,48	10,2	8,8	8,8
07.11.2006	02:10:00	4,37	89,08	10,18	8,8	8,8
07.11.2006	02:20:00	4,04	88,93	10,1	8,8	8,8
07.11.2006	02:30:00	3,9	89,98	10,1	8,75	8,75
07.11.2006	02:40:00	3,8	100	10,1	8,7	8,7
07.11.2006	02:50:00	3,65	100	10,1	8,7	8,7
07.11.2006	03:00:00	3,48	100	10,1	8,88	8,88
07.11.2006	03:10:00	3,61	100	10,07	8,6	8,6
07.11.2006	03:20:00	3,47	100	10	8,6	8,6
07.11.2006	03:30:00	3,45	100	10	8,58	8,58
07.11.2006	03:40:00	3,32	100	10	8,5	8,5
07.11.2006	03:50:00	3,35	100	10	8,5	8,5
07.11.2006	04:00:00	3,32	100	10	8,5	8,5



# SmartView3, the forecasting models

Prerequisite:

- "Collector" basic package
- SmartView3 visualization

**Scab calculation in accordance with latest scientific knowledge (Venturia inaequalis)**

**8040.VENTURIA,**

**Peronospora calculation (downy mildew)**

**8040.PERO,**

**Oidium calculation (powdery mildew)**

**8040.OIDIUM,**

**Botrytis calculation**

**8040.BOTRY,**

**Any desired models can be incorporated!**

