

**Satellite Meeting**  
**"Conservation and preservation of library material in a cultural-heritage oriented context"**

**31 August - 1 September 2009**  
**Rome, Italy**

**Organized by IFLA Core Activity on Preservation and Conservation  
and IFLA Preservation and Conservation Section**

Thanks to the support of:



# Protimeter Hygro Trac<sup>®</sup>

## Remote Wireless Monitoring System

The experiences of a web based monitoring  
system for climate control in the Exhibition Hall at  
Uppsala University Library

by  
Lars Björdal

# Protimeter Hygro Trac<sup>®</sup>

Made by:

GE sensing,

1100 Technology Park Drive Billerica,

MA 01821-4111,

USA

[www.gesensing.com/protimeterproducts](http://www.gesensing.com/protimeterproducts)

# First some facts of Uppsala

- 1000 years old
- 200 000 peoples in the community
- Situated 70 km north from Stockholm (40 min by train)
- Uppsala University was founded in 1477
- More than 30 000 students
- Olof Rudbeck senior, Carl von Linné, Anders Celcius, The Svedberg are famous scientists who were professors there
- Uppsala is the hostage for the Archbishop of The Swedish Church and its administration

# Uppsala University Library





# “Carolina Rediviva”

- The Library building is from 1834, by Carl Fredrik Sundvall
- The name of the building “the revived Carolina Academy” refers to an older university building called *Academia Carolina*, which was demolished in the 18th century.
- Today the Library is “spread out” over the campus in new buildings and the old building is the home for the administration, new medias, modern collections of arts and humanities, the culture heritage collections and a small exhibition hall
- The Library has about 133 kilometres of shelves with printed materials



# The Entrance to the Exhibition Hall



# Expo Rediviva

- A treasure trove of books, manuscripts, maps and pictures
- The Silver Bible *Codex Argenteus*, from 4<sup>th</sup> century
- Carta Marina – first complete map over Scandinavia
- The Uppsala Eddan – famous medieval Icelandic saga book
- Mexico City – 16<sup>th</sup> century Aztec map
- Mozart's draft manuscript for "The Magic Flute"

For more information see:  
[www.uu.ub.se](http://www.uu.ub.se)





# The Cabinets

Three bigger, for exposing the highlights (4 x 3 x 1,5 m)



# The Cabinets

Three smaller, for thematic exhibitions (3 x 2 x 0,5 m)





- The Cabinets are built in steel, equipped with 3 ply laminated glass, security lockers, alarm system and Silica Gel humidification system.
  - Temp 21 - 23° C, RH 35 - 40%, Light 50 LUX



# The Silver Bible cabinet





# Those were the days...

- Older climate control systems were reliable if handled right, but...
- Did you wind the clockwork?
- Did you switch the paper and the ink?
- Did you change the batteries?



# Hygro Trac<sup>®</sup> System

- System components...
  - Data acquisition gateway connected to the internet
  - Wireless sensors transmitting to the gateway
  - Up to 46 m (150ft) transmitting distance
  - Up to 15 years lifetime for the logger batteries
  - No “full memory” alert or losses of data because of dead batteries

GE  
Sensing

Protimeter HygroTrac<sup>®</sup>  
*Remote Wireless Monitoring System*



Instruction Manual  
INS9000B  
October 2006

HygroTrac is a Protimeter product. Protimeter has joined other GE high technology businesses under a new name—GE Industrial, Sensing

# Hygro Trac<sup>®</sup> System

- Measures and logs parameters such as the following:
- GPP or g/kg
- Dew point temperature
- Relative humidity
- Air temperature
- % moisture in wood

GE  
Sensing

Protimeter HygroTrac<sup>®</sup>  
*Remote Wireless Monitoring System*



Instruction Manual  
INS9000B  
October 2006

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# Hygro Trac<sup>®</sup> System

- System component kit:  
€ 3000,-
  - Data acquisition gateway
  - 10 wireless sensors with lithium batteries
  - Power supply unit, 3,3 V DC
  - Ethernet cable
  - Instruction manual

System Components (cont.)



Figure 1: BLD9000 Kit



# Hygro Trac<sup>®</sup> System

- Data acquisition gateway – rear panel
- Antenna, SD card slot, Phone line port, LAN port, RS232 port, Power-input

To install your Data Acquisition Gateway, refer to *Figure 2* below.

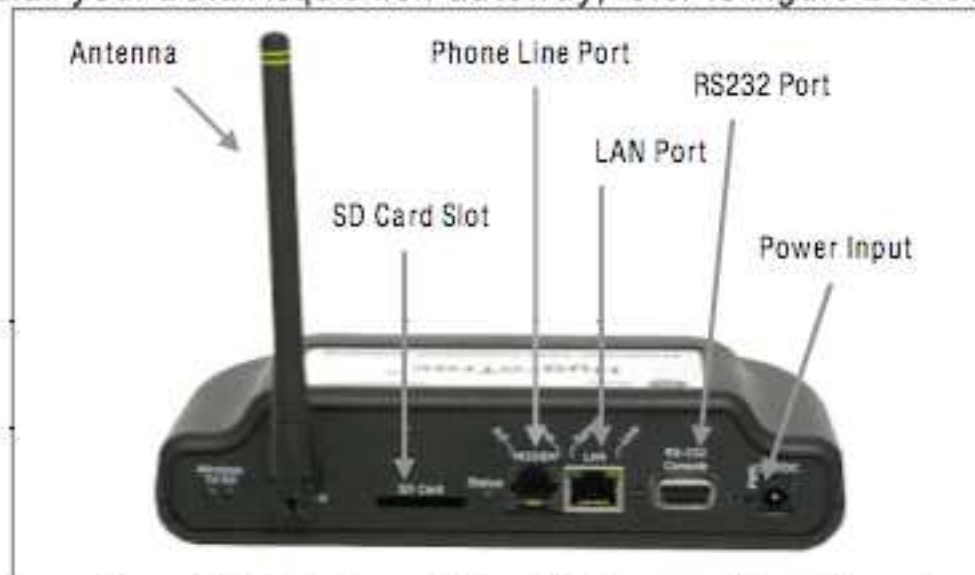


Figure 2: Data Acquisition Gateway - Rear Panel

# Hygro Trac<sup>®</sup> System

- The loggers are designed for both permanent or temporary installations

## Suitable for:

- Heritage and historic buildings
- Museums
- Food storage
- Apartment buildings



# Hygro Trac<sup>®</sup> System

- No software is needed
- All measures are stored on a web server
- The results are reached from any computer via a secure web page
- Provides early warnings of targets reached and potential problems through e-mail alerts and cellular text messages (SMS)



The gateway unit hidden on the top of a cabinet







One of the loggers hidden under one of the documents



## Sensors for Carolina Utställning/Ramböll

Print

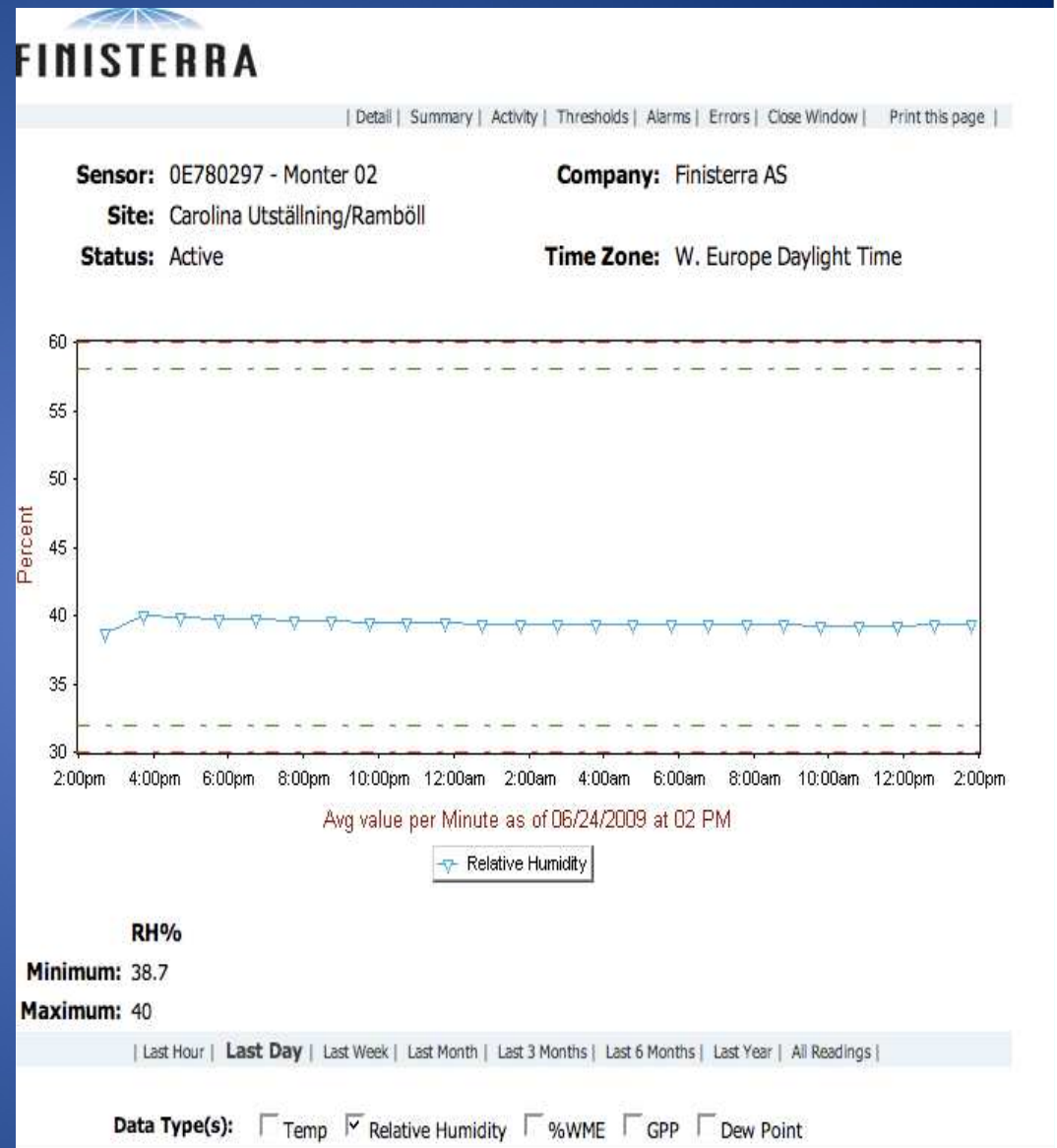
Only Show Sensors With Active Alarms  Yes  No  
 Only Show Active Sensors  Yes  No

Moisture Content								
Sensor Id	Description	Last Activity	Sts	Temp	RH%	%WME	GPP	Dew Pnt.
0E780589	Codex	06/25.09:52	A	22.80	38.4	---	46.40	8.00
0E781130	Monter 01	06/25.10:39	A	22.90	38.9	---	47.50	8.30
0E780297	Monter 02	06/25.10:49	A	22.60	39.2	---	46.90	8.10
0E780074	Monter 06	06/25.10:45	A	22.30	33.4	---	39.10	5.50
0E78091B	Monter 07	06/25.09:58	A	22.70	45.4	8.0	54.70	10.40
0E7822A4	Monter 08	06/25.10:49	A	22.50	38.3	---	45.40	7.60
0E7821FE	Monter 09	06/25.10:50	A	22.50	37.3	---	44.30	7.30
0E780818	Monter 10	06/25.10:49	A	22.50	37.6	---	44.60	7.40
0E782230	Salen vid entrén	06/25.09:54	A	23.30	42.2	---	52.60	9.80
0E780643	Salen vid monter 09	06/25.10:06	A	23.30	42.1	8.0	52.50	9.80

\* indicates an alarm has been triggered for that sensor.

# Cabinet no.2

- Relative humidity
- 24 hour period, 24/6 -09
- Min 38,7 % RH
- Max 40 % RH

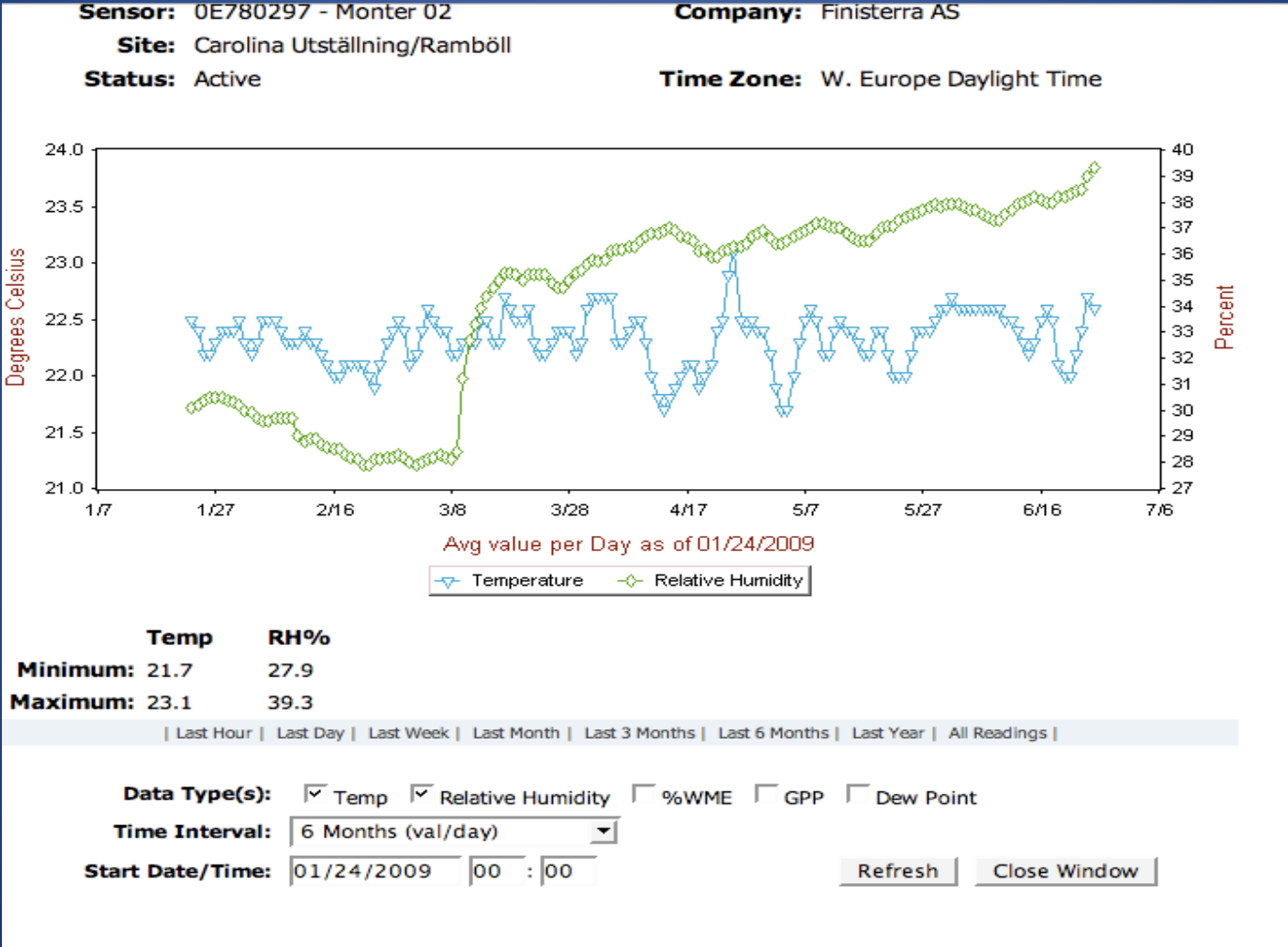




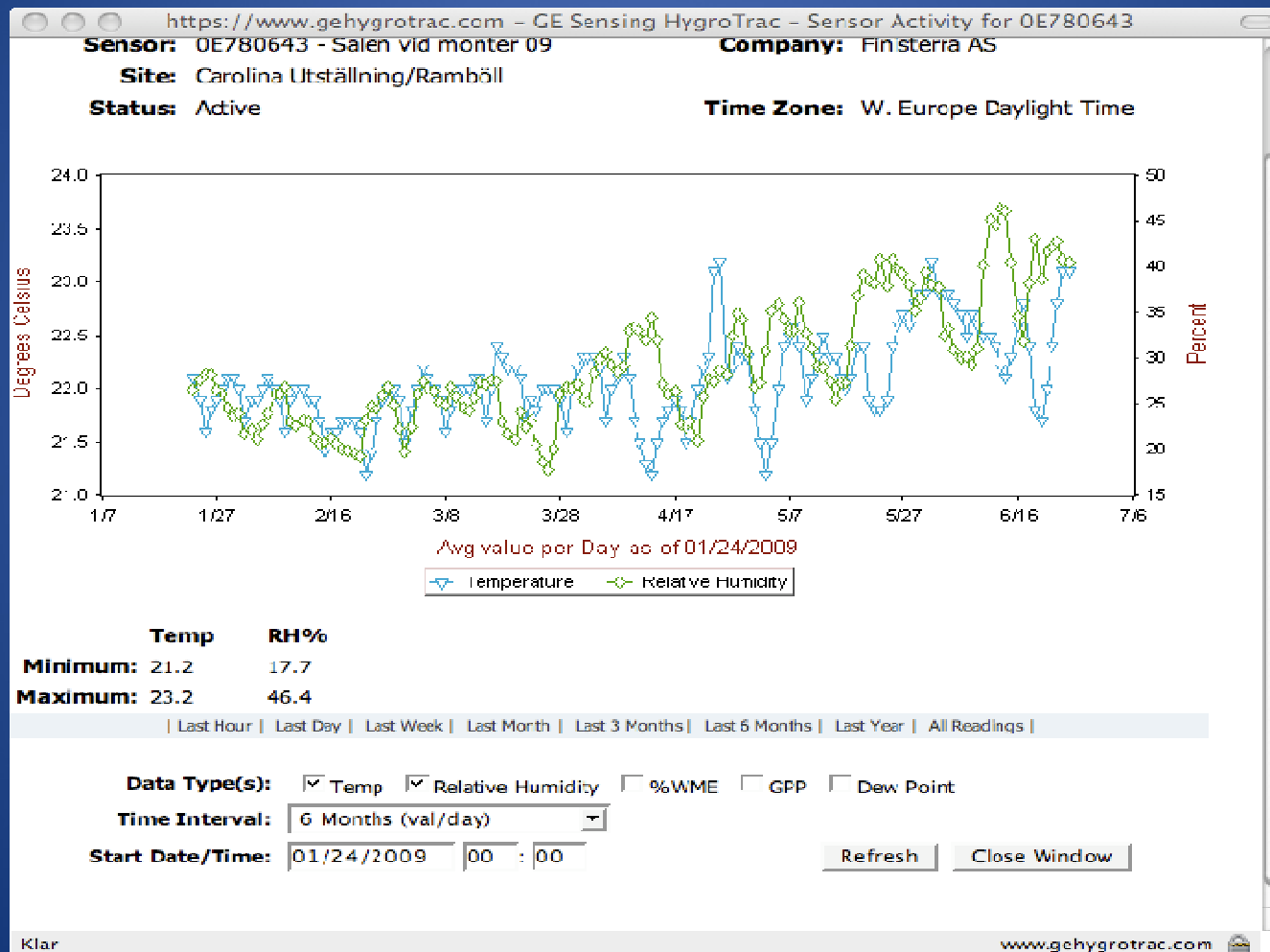
# Cabinet no.2: Temperature and Relative Humidity, 24 hour period, 24/6-09



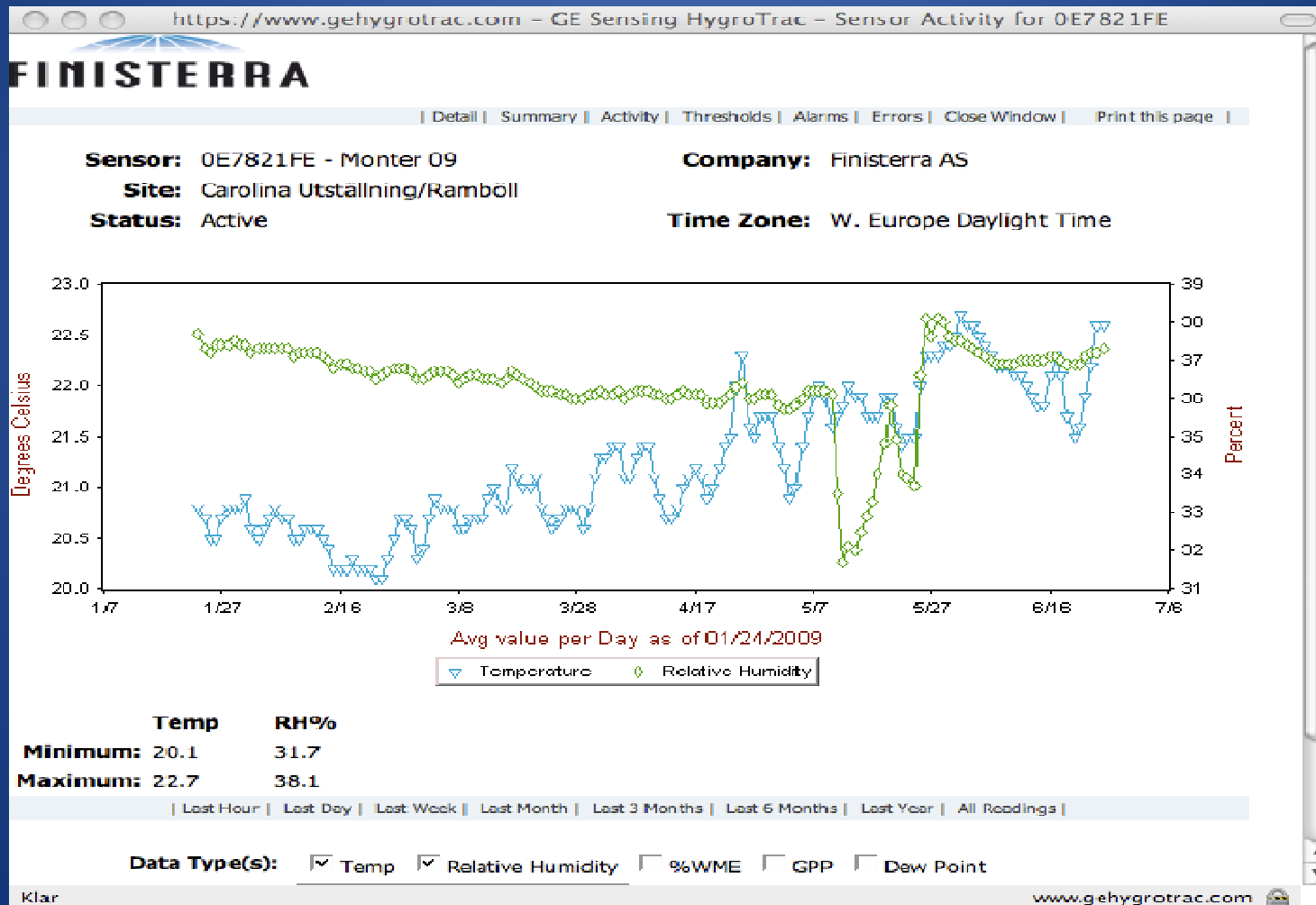
# Cabinet no.2: Temp and RH, 6 months period 24/1-09 – 6/7-09



# Outside the Cabinet no.9: Temp and RH, 6 months, 24/1-09 – 6/7-09



# Cabinet no.9: Temp and RH, 6 months, 24/1-09 – 6/7-09



# Data transferred to an Excel spread sheet

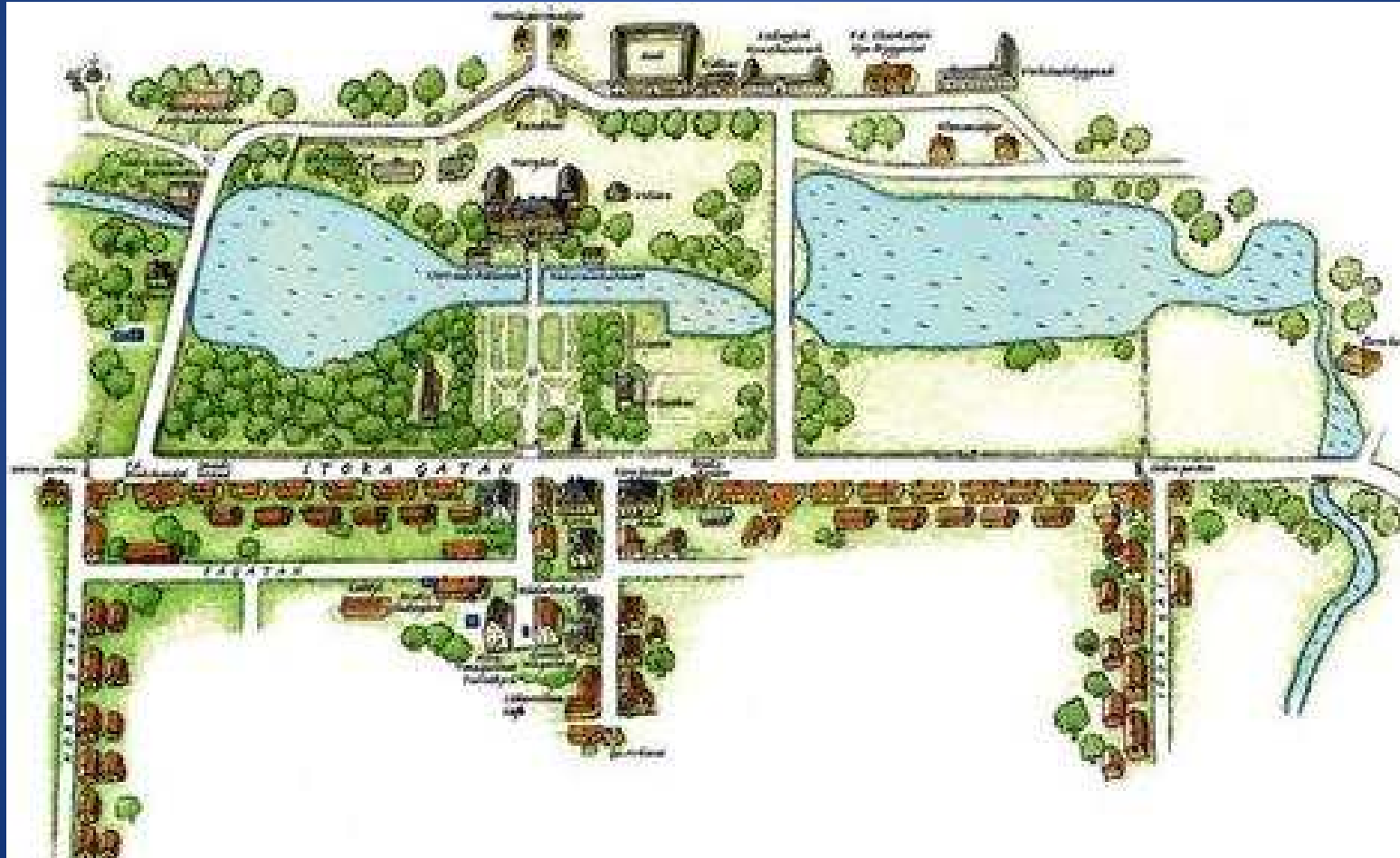
	Blad		Diagram		SmartArt-grafik		WordArt	
◇	A	B	C	D	E	F	G	H
1	Read_Date	Sensor_Id	Degrees	Pct_Humid	Moisture_F	GPP	Dew_Pnt	
2	3/15/2008 12:02:38 AM	0C8F0300	1,5	84,4	8,7	25,0	-0,8	
3	3/15/2008 12:07:54 AM	0C8F0300	1,4	84,5	8,7	24,8	-0,8	
4	3/15/2008 12:13:10 AM	0C8F0300	1,3	84,6	8,7	24,7	-1,0	
5	3/15/2008 12:18:26 AM	0C8F0300	1,3	84,7	8,7	24,7	-0,9	
6	3/15/2008 12:23:42 AM	0C8F0300	1,3	84,8	8,7	24,7	-0,9	
7	3/15/2008 12:28:58 AM	0C8F0300	1,2	84,9	8,8	24,5	-1,0	
8	3/15/2008 12:34:14 AM	0C8F0300	1,1	85,0	8,8	24,4	-1,1	
9	3/15/2008 12:39:30 AM	0C8F0300	1,0	85,1	8,8	24,3	-1,2	
10	3/15/2008 12:44:46 AM	0C8F0300	1,0	85,3	8,8	24,3	-1,1	
11	3/15/2008 12:50:02 AM	0C8F0300	1,1	85,3	8,8	24,4	-1,1	
12	3/15/2008 12:55:18 AM	0C8F0300	1,1	85,2	8,8	24,4	-1,1	
13	3/15/2008 1:00:34 AM	0C8F0300	1,1	85,0	8,8	24,5	-1,1	
14	3/15/2008 1:05:50 AM	0C8F0300	1,2	84,9	8,7	24,6	-1,0	
15	3/15/2008 1:11:06 AM	0C8F0300	1,3	84,8	8,7	24,7	-0,9	
16	3/15/2008 1:16:24 AM	0C8F0300	1,3	84,6	8,7	24,6	-1,0	
17	3/15/2008 1:21:38 AM	0C8F0300	1,3	84,3	8,7	24,6	-1,0	
18	3/15/2008 1:26:54 AM	0C8F0300	1,3	84,2	8,7	24,5	-1,0	
19	3/15/2008 1:32:10 AM	0C8F0300	1,4	84,1	8,7	24,6	-1,0	
20	3/15/2008 1:37:26 AM	0C8F0300	1,4	83,7	8,7	24,5	-1,0	
21	3/15/2008 1:42:42 AM	0C8F0300	1,4	83,7	8,7	24,6	-1,0	
22	3/15/2008 1:47:58 AM	0C8F0300	1,5	83,7	8,7	24,7	-0,9	
23	3/15/2008 1:53:14 AM	0C8F0300	1,5	83,6	8,7	24,7	-0,9	
24	3/15/2008 1:58:30 AM	0C8F0300	1,5	83,6	8,7	24,8	-0,9	
25	3/15/2008 2:03:46 AM	0C8F0300	1,6	83,5	8,7	24,8	-0,9	
26	3/15/2008 2:09:02 AM	0C8F0300	1,6	83,6	8,7	24,8	-0,9	
27	3/15/2008 2:14:18 AM	0C8F0300	1,6	83,6	8,7	24,9	-0,8	
28	3/15/2008 2:19:34 AM	0C8F0300	1,6	83,7	8,7	25,0	-0,8	
29	3/15/2008 2:24:50 AM	0C8F0300	1,7	83,6	8,7	25,0	-0,8	
30	3/15/2008 2:30:06 AM	0C8F0300	1,7	83,7	8,7	25,0	-0,7	
31	3/15/2008 2:35:22 AM	0C8F0300	1,7	83,7	8,7	25,1	-0,7	



# The Library of Lövsta Castle



Lövsta Castle, 60km north from Uppsala, was built in the later 1600 by the rich businessman Louis De Geer from Liège. He was trading with iron and is known as the father of the Swedish industry.



Lövsta Library, about 8500 books from 17<sup>th</sup> and 18<sup>th</sup> century. The Library is the result of Charles De Geer's (1720-1778) great interest in science. He also became a famous Entomologist.





Linnés Hammarby,  
Carl von Linné's house just outside Uppsala,  
is equipped with a Hygro Trac<sup>®</sup> system



# Hygro Trac<sup>®</sup> System - Conclusions

- So far so good...
  - Not too expensive
  - Stable system
  - Easy to use
  - Reliable alert system

GE  
Sensing

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# Piazza Navona water vapour cooling system®



*Thank you!*