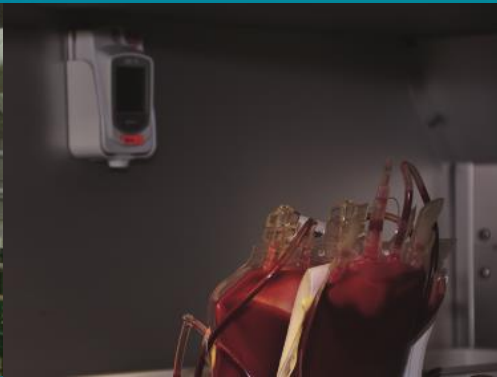


# Ebro Webinar Session 3: Cold Chain, Storage and Distribution Solutions for the Medical and Healthcare Products and Processes



# Ebro- Xylem Analytics Webinar:

## *This Session's Topics and Presentation -*

# Cold Chain, Warehouse & Distribution

Monitoring, Recording and Continuous Surveillance Solutions



**Cold Chain and Distribution for the Healthcare and Medical Products and Processes**

- **Your QC works and responsibilities covered even after your products are leaving your Laboratories and Production Facilities**

# Ebro Product Classifications:

## Other Applications

Food & beverages



- Logistics / Storage
- Transport

- Food Oil Quality
- Process Schedule Verification
- Vacuum Measurements / Headspace Establishment
- Freezing Methods

Medical & Pharmacy



- Logistics / Storage
- Transport
- Sterilization
- EtO Sterilization

- H<sub>2</sub>O<sub>2</sub> Sterilization
- Depyrogenation
- Lyophilization
- Freeze Drying

Industrial



- General
- Incubators

- Clean rooms
- Mapping



# To all our Business Partners and Customers...

*In behalf of our management and colleagues in the Xylem Analytics Team, and the whole of Xylem, we wish only the best of everything to everyone, everywhere!*

*“ I am confident that nobody will accuse me of selfishness if I ask to spend time, **while I am still in good health**, with my family, my friends and also especially to spend time with myself”*































**- Nelson Mandela**

# Who is Xylem?

We are one of the world's leading water technology companies



# Bringing together the most progressive brands

Transport	Treatment	Dewatering	Applied Water Solutions		Measurement & Control Solutions		
 	   	  	     	<p>Specialty Flow Control</p>   	 	<p><b>Analytics</b></p>           	<p>Advanced Infrastructure Analytics</p>       

# Cold Chain Monitoring (Cool Chain)

Regulated Processes / References in Healthcare / Pharmaceuticals

”Action of providing, in accordance with the principles of Good Manufacturing Practice, that any procedure, process, equipment, activity or system actually leads to the expected results.”

- Specific Ebro Instruments that are made suitable for the following:

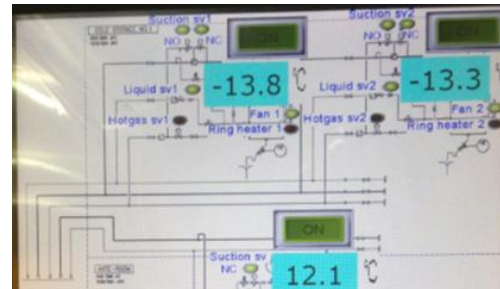
Research

Production

Storage

Transport

Procedures from Guidelines and Protocols in the Pharmaceuticals and Medical



Used in incubators, environmental chambers, fridges, deep-freezers, stability rooms, storage facilities and many others



# Cold Chain Monitoring (Cool Chain)

Regulated Processes / References in Healthcare / Pharmaceuticals

Requirements for Temperature and Humidity Records to accurately document product transport conditions and must capture possible negative impacts on the goods.

## Destinations and recipients includes:

- Hospitals
- Pharmacies / Drug Stores
- Resident Doctors
- Warehouses





# Cold Chain Monitoring (Cool Chain)

Regulated Processes / References in Healthcare / Pharmaceuticals

Each transported batches of temperature-sensitive products has to be monitored.

Due to highly different scenarios, transport validation is very difficult

Measuring requirements:

- Ambient Temperature
- Product Temperature
- Temperature inside the parcel



# Cold Chain Monitoring (Cool Chain)

Regulated Processes / References in Healthcare / Pharmaceuticals

For Storage Facilities and Storage Areas, Temperature and Humidity measurements are very necessary.

Temperature and Humidity, when outside the required limits, have Great and adverse effects to the following:

- Raw Materials
- Intermediate Products
- Final Products
- Retained Samples

Storage conditions must correctly determine and exclude negative impacts on the goods and therefore needs to be monitored.



# Cold Chain Monitoring (Cool Chain)

## The Ebro Solutions

EBI 20



EBI 3x0



EBI 25



- Temperature / temperature & humidity logger
- Different versions are available
- Needs an interface and a software
- One interface and as many loggers as you want
- Can be programmed with our free software Winlog.basic
- -30°C...+100°C
- at least ±0,5°C
- 40.000 values memory

- Temperature USB logger (temperature/humidity with external sensor)
- Different external sensors are available
- Doesn't need an interface or software
- Can be programmed on the website [www.ebi300.com](http://www.ebi300.com)
- Automatically creates a PDF report, when connected to PC or printer
- -200°C...+400°C
- at least ±0,2°C
- At least 40.000 values memory

- Automatic wireless temperature and humidity monitoring & alarm system
- Measurement values are displayed on the PC/server nearly in real time
- Different logger versions are available
- Needs an interface and a software
- Software sends alarm emails and creates PDF reports automatically
- -200°C...+200°C
- at least ±0,2°C
- 288 values memory per channel

Most Affordable and Practical Solution

Disposable One-Time Use & Multi-Use Available

Continuous Monitoring & Surveillance

# Cold Chain Monitoring (Cool Chain)

The Ebro Solutions – EBI 20



**EBI 20-T1 and EBI 20-TE1**

**EBI 20-TH1**

**EBI 20-TF**

Measurement  
range

-30°C ...+70°C

-30°C ...+70°C  
0%rh...100%rh

0°C ...+100°C

Accuracy

±0,5°C (-20°C ...+40°C )  
±0,8°C (remaining range)

±0,5°C (-20°C ...+40°C )  
±0,8°C (remaining range) ±3%rh

±0,5°C (+50°C ...+100°C )  
±1,0°C (remaining range)

Memory

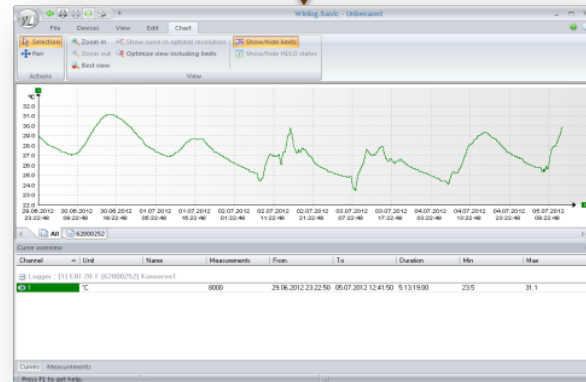
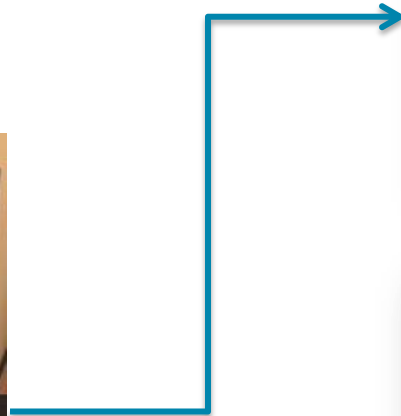
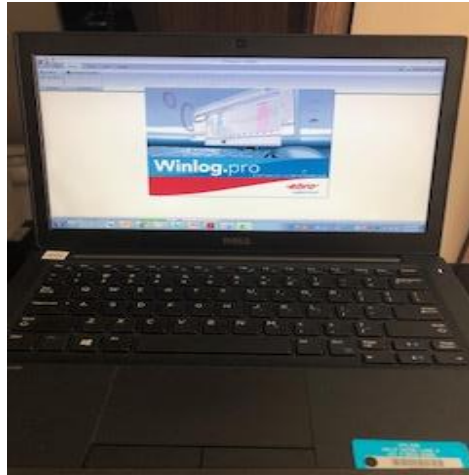
40.000 values

40.000 values

8.000 values

# Cold Chain Monitoring (Cool Chain)

The Ebro Solutions – EBI 20





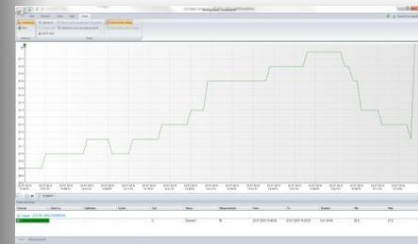
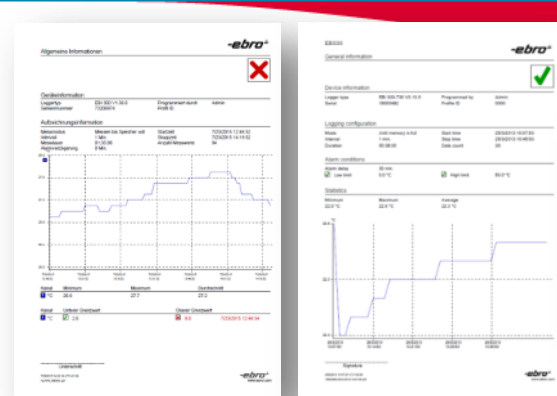
# Cold Chain Monitoring (Cool Chain)

The Ebro Solutions – EBI 20



# Cold Chain Monitoring (Cool Chain)

## The Ebro Solutions – EBI 3x0 Temperature and Humidity Logger



- Temperature USB Logger (temperature/humidity with external sensor)
- Different external sensors are available
- No interface or software needed
- Automatically creates a PDF report, when connected to PC or printer

### Applications

- Transport
- Storage Units /Room monitoring /Stability Rooms
- Refrigerators
- Deep-freezers
- Cryogenic vessels



# Cold Chain Monitoring (Cool Chain)

## The Ebro Solutions – EBI 3x0 Temperature and Humidity Logger

### Applications

- Transport of food, beverages, drugs, serums, blood bottles, dry ice and raw materials
- Transport of all temperature sensitive materials
- Storage monitoring of samples in freezers and deep-freeze rooms
- Refrigerators and deep-freezers in pharmaceutical companies and supermarkets

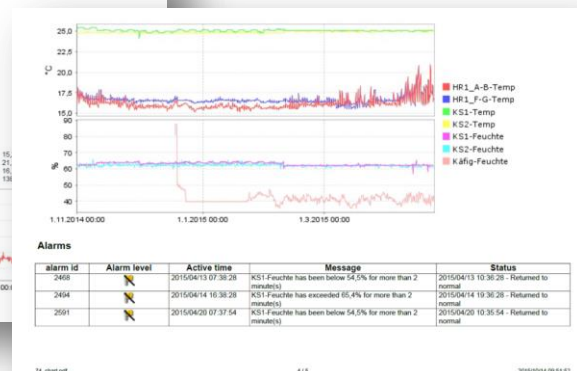
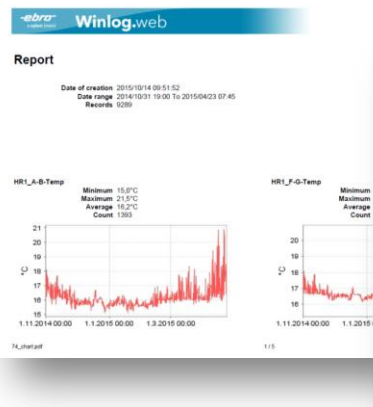


# Cold Chain Monitoring (Cool Chain)

## The Ebro Solutions – EBI 25 Complete Surveillance and Recording System



- Automatic wireless temperature and humidity monitoring and alarming system
- Measurement values are displayed on the PC/server in real time
- Different logger versions are available
- Needs an interface and a software
- Software sends alarm emails and creates PDF reports automatically



# Cold Chain Monitoring (Cool Chain)

## The Ebro Solutions – EBI 25 Complete Surveillance and Recording System

### Wireless Data Points

- EBI 25 Temperature sensors
- EBI 25 Humidity Sensors

### Data Sources

- EBI 25 interface (TCP/IP or USB)
- Other sensors integrated via modbus

### Data Display and Storage

- Winlog.Web - network based software
- Winlog.Wave – Single PC based software



# Cold Chain Monitoring (Cool Chain)

The Ebro Solutions – EBI 25 Complete Surveillance and Recording System



	EBI 25-T	EBI 25-TH	EBI 25-TE	EBI 25-TX
<b>Measurement range</b>	-30°C ...+60°C	-30°C ...+60°C 0%rh...100%rH	-40°C ...+85°C	-200°C ...+200°C
<b>Accuracy</b>	At least ±0,5°C	At least ±0,5°C ±3%rH	At least ±0,5°C	At least ±0,2°C
<b>Part Number</b>	1340-6200	1340-6202	1340-6201	1340-6204

# Cold Chain Monitoring (Cool Chain)

The Ebro Solutions – EBI 25 Complete Surveillance and Recording System

## Winlog.web

- **Web based client / server solution:**

Software can be installed on a local PC and also on a server. The measurement data can be evaluated on all PCs and smartphones via the internet or connected to the local network

- Very flexible and wide alarm management; alarm notifications according to user defined conditions; alarm notification via email; visual and audible alarm via the graphical user interface
- Connection of the IF 400 can be either via USB and / or Ethernet
- FDA 21 CFR Part 11 data security functionality
- Management of large data sets
- IQ/OQ Documentation available





# Cold Chain Monitoring (Cool Chain)

The Ebro Solutions – EBI 25 Complete Surveillance and Recording System

## Applications:

- Storage of food, beverages, drugs, serums, blood bottles, dry ice and raw materials
- Storage monitoring of samples in freezers and deep-freeze rooms
- Refrigerators and deep-freezers in pharmaceutical companies and supermarkets



# Cold Chain Monitoring (Cool Chain)

The Ebro Solutions – Healthcare Warehouse Surveillance and Recording System





# Pharmaceutical / Healthcare Requirements

Regulated and for Strict Compliance

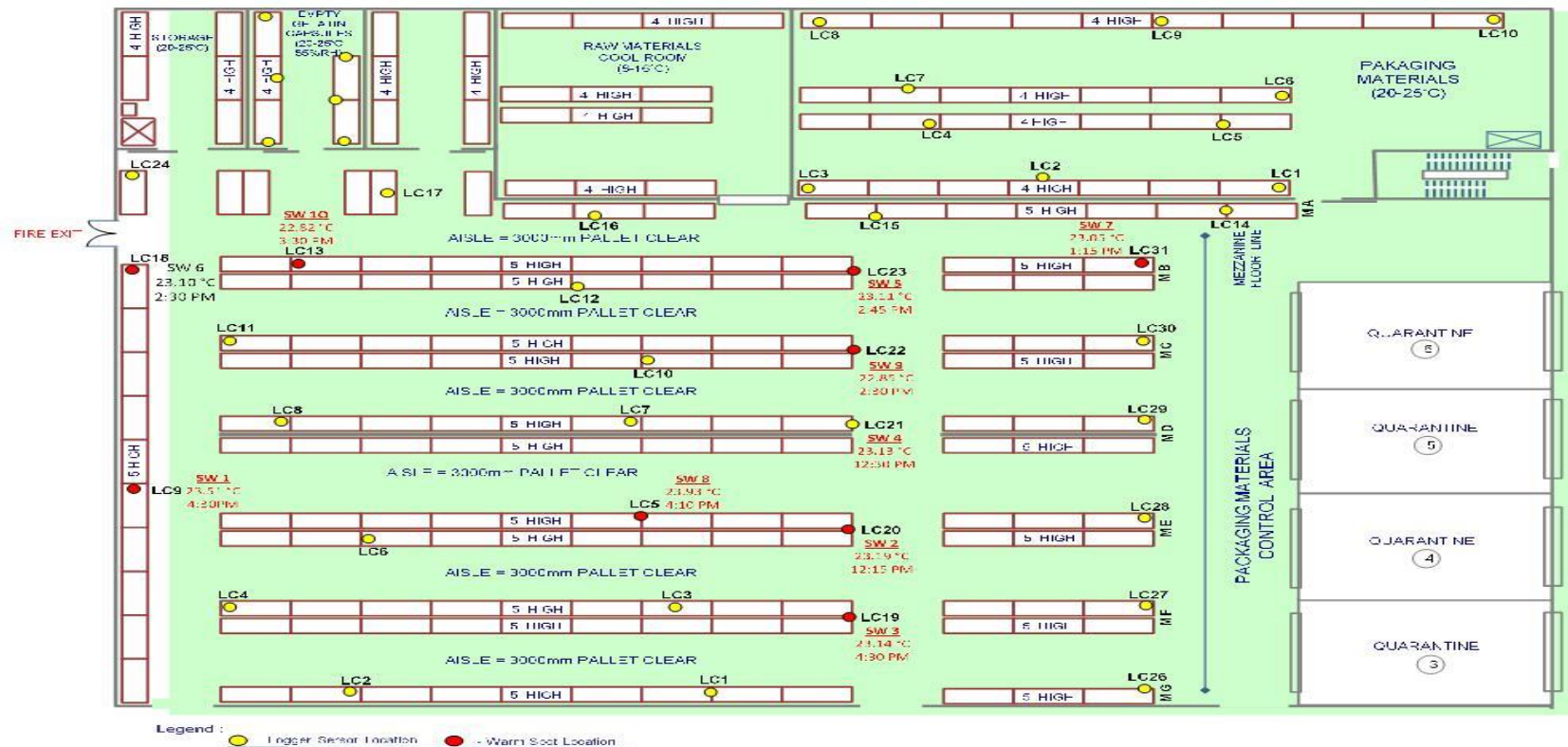
## Stability Rooms / Warehouses – Thermal Mapping

- After manufacturing and before the dispatch of a pharmaceutical product it needs to be stored in a controlled environment
- The environment may be subject to regulatory compliance, which makes validation and monitoring necessary
- The critical parameters are usually temperature and humidity
- The parameters cannot exceed certain limit values and the variations need to be documented

# Pharmaceutical Requirements

Regulated and for Strict Compliance

## Stability Rooms / Warehouses – Thermal Mapping



# Pharmaceutical Requirements

Regulated and for Strict Compliance

## Stability Rooms / Warehouses – Thermal Mapping

- To check the performance of a controlled warehouse
- To determine the cold and warm regions of the warehouse
- To confirm pre-defined temperature / humidity ranges
- To identify and improve temperature / humidity equilibration
- To determine the highest temperature / humidity fluctuations
- To revalidate the location of the existing fixed sensors of the current monitoring system
  
- To Calculate **MKT** which can be generated automatically in the Winlog.Pro Software

# Pharmaceutical Requirements

Regulated and for Strict Compliance

## TEMPERATURE or THERMAL MAPPING REQUIREMENTS:

### FOOD PRODUCTS:

- *Shelf-Life of Processed Food*
- *Efficiency of Chilled or Cold Storage for Food*
- *Adequacy of Freezing Methods*
- *Proper Storage of Hygroscopic Food Products **- IMPORTANT!***

### PHARMACEUTICAL / HEALTHCARE PRODUCTS:

- *Stability Studies*
- *Regulated*
- *According to ASEAN Harmonization of Pharmaceutical Standards*
- *For Compliance to Regulations*
- *For Compliance to Pharmaceutical GDP – Good Distribution Practices*

# Pharmaceutical Requirements

## Thermal Mapping for Critical Processes

- *Stability Studies as a Pharma Requirement*

*Essential to determining the lifecycle of pharmaceutical products especially on the API or Active Pharmaceutical Ingredient and excipients*

- *Regulated Industry from Raw to Finished Products*

*A requirement to show evidence that the possible influence of a variety of environmental factors such as temperature, humidity and lighting to the raw materials and the finished products are determined. This makes Temperature Mapping a compulsory requirement in the Pharmaceuticals.*

- *ASEAN Harmonization of Standards*

*Primarily to address the verification and validation of storing pharmaceutical products in their corresponding pre-determined STORAGE CONDITIONS especially in TROPICAL COUNTRIES where extreme Humidity and Temperature conditions may occur and be a factor to the degradation of the pharmaceutical products.*

- *USP, GMP, cGMP, GDP and the Norms/Standards*

# Pharmaceutical Requirements

## Thermal Mapping for Critical Processes

- *USP, GMP, cGMP, GDP and the Norms/Standards*

[http://www.who.int/medicines/areas/quality\\_safety/quality\\_assurance/GuideGoodStoragePracticesTRS908Annex9.pdf](http://www.who.int/medicines/areas/quality_safety/quality_assurance/GuideGoodStoragePracticesTRS908Annex9.pdf)

World Health Organization; WHO Technical Report Series, # 908, 2003:

*Guide to Good Storage Practices for Pharmaceuticals*

**Storage** in dry, well-ventilated premises at temperatures of 15–25°C or, depending on climatic conditions, up to 30°C. Extraneous odours, other indications of contamination, intense light must be excluded. Drug products that must be stored under defined conditions require appropriate storage instructions.

**IFP** – *International Pharmaceutical Federation*

**...“The Guidelines are applicable not only to Manufacturers of Medicinal Products but also to Pharmaceutical Importers, contractors and wholesalers and hospital & community Pharmacies...”** *These are therefore our CUSTOMERS!*

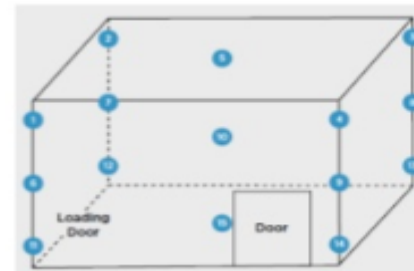
# Pharmaceutical Requirements

## Thermal Mapping for Critical Processes

- **Pharmaceutical Warehouses**
  - *Thermal Mapping Protocols*
  - *Determine the RCL and URS for the Warehouse/Storage*
  - *Approval of the Mapping Protocols as covering both the above documentations*
  - *MKT Calculations are required in the Evaluation of the Thermal Mapping Results*

*In the Protocols, the most important issues are the following:*

- *Determine the grids / distance from one sensor to another*
- *Thermal Mapping Duration*
- **ACCEPTANCE CRITERIA**
- *The right quantity of measuring points that are to be used in the data acquisition and mapping implementations*





# Thermal Mapping – Pharmaceutical



## Supplement 7

# Qualification of temperature-controlled storage areas

Technical supplement to WHO Technical Report Series, No. 961, 2011

*Annex 9: Model guidance for the storage and transport of time- and temperature-sensitive pharmaceutical products*



USP 36

General



(1079) GOOD STORAGE AND DISTRIBUTION PRACTICES FOR DRUG PRODUCTS

## VALIDATION AND THERMAL PERFORMANCE QUALIFICATION FOR TRANSPORT SYSTEMS

Drug product transport systems should be continuously monitored by calibrated monitoring systems, (continuous verification), or shipping systems should be qualified and based on historical data relative to the process. However, it may be acceptable to use product stability data and supply chain risk assessment to justify shipping without either continuous monitoring or qualification of the shipping system.

Operational and performance shipping studies should on a generic level be part of a formal qualification protocol that may use controlled environments or actual field testing, depending on the projected transport channel. These studies should reflect actual load configurations, conditions, and expected environmental extremes. Testing should be performed on both active and passive thermal packaging systems.

applicable areas, as well as a plan of action in the event of an unacceptable excursion.

## TEMPERATURE MAPPING

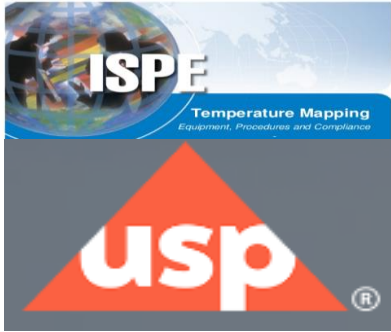
The basis of any temperature mapping in a temperature controlled space (e.g., facility, vehicle, shipping containers, refrigerator, freezer) is the identification and documentation of a sound rationale used for a given mapping procedure. The temperature variability associated with mapped locations and the level of thermal risk to the product should be defined, unless another process has been put in place to ensure environmental control.

A temperature mapping study should be designed to assess temperature uniformity and stability over time and across a three-dimensional space. Completing a three-dimensional temperature profile should be achieved by measuring points at not less than three dimensional planes in each direction/axis—top-to-bottom, left-to-right, front-to-back, where product will be present.

When temperature mapping is necessary, it should begin

# Thermal Mapping – Pharmaceutical

- PHARMA – THE DIFFERENT GUIDELINES



*THERMAL MAPPING PROTOCOLS*



USP 36

General



*THERMAL MAPPING PROTOCOLS*

<1079> GOOD STORAGE AND  
DISTRIBUTION PRACTICES FOR  
DRUG PRODUCTS

# Thermal Mapping – Pharmaceutical

- PHARMA – THE DIFFERENT GUIDELINES

## THERMAL MAPPING PROTOCOLS



*International Council For Harmonisation*

*ICH Guidelines are adopted as law in several countries, but are only used as Guidance for the U.S. FDA*

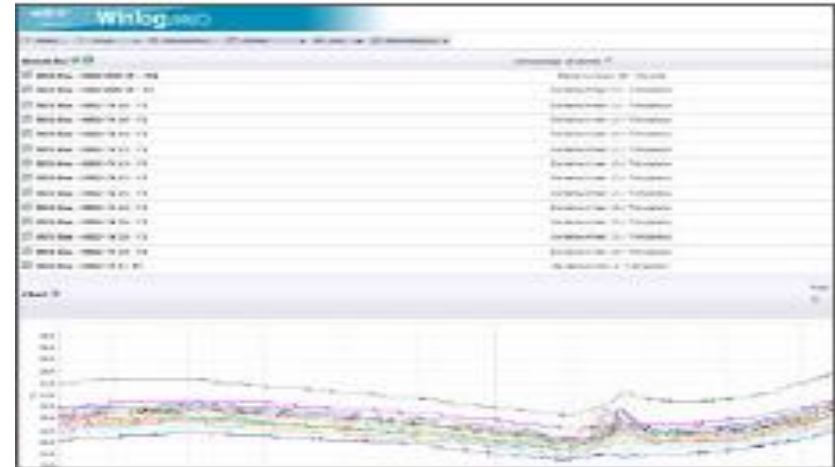
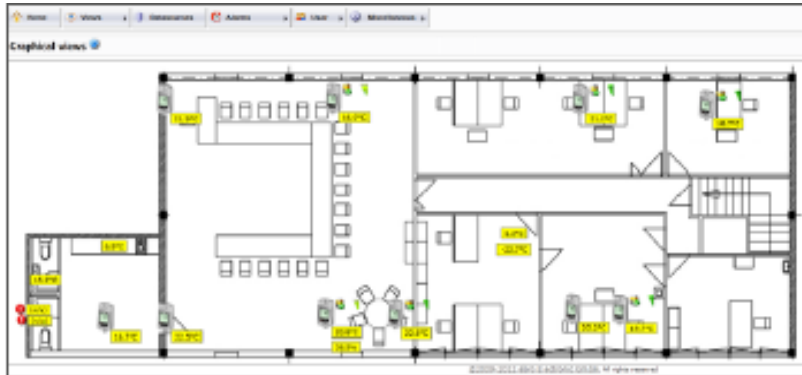
*-Discussion on sample protocols*

# Pharmaceutical Requirements

Regulated and for Strict Compliance

## Stability Rooms / Warehouses – Control and Monitoring

- It is necessary to control the temperature and humidity using an automated monitoring system*



# Pharmaceutical Requirements

Regulated and for Strict Compliance

## Validation of Incubators – Thermal Mapping





# Pharmaceutical Requirements

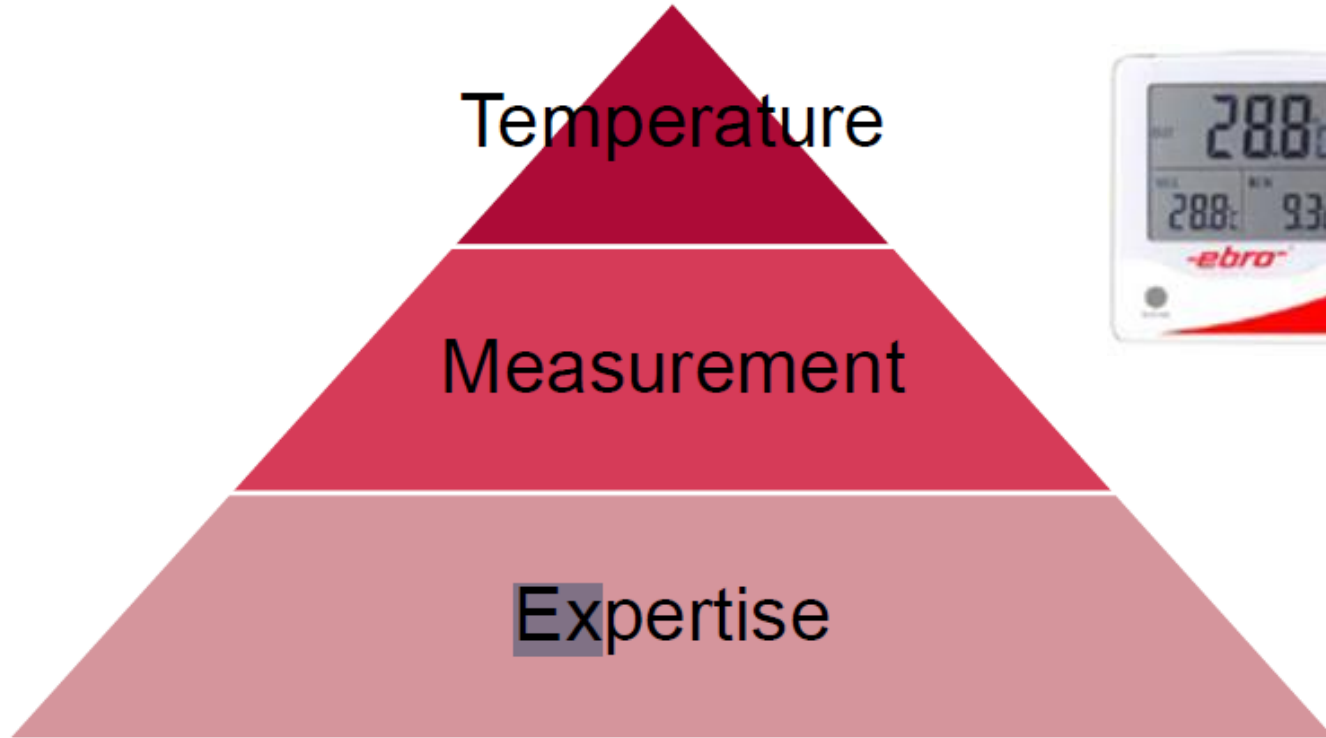
Regulated and for Strict Compliance

## Validation of Refrigerators – Thermal Mapping



# Pharmaceutical Requirements

TMX Refrigerator Thermometer





# Pharmaceutical Requirements

## TMX Refrigerator Thermometer



- Active Temperature control in laboratory
- Acoustic alarm when limit has been exceeded
- Optical alarm as well
- Current value, minimum and maximum value on one view
- Sensor in glycol bottle avoids short temperature changes

# Pharmaceutical Requirements

## TMX Refrigerator Thermometer



- Why to use a thermometer instead of a data logger?
  - All Information in one view. The thermometer shows always MAX/MIN and current value.
  - Active alarm control. TMX gives an acoustic and optical alert if a limit was exceeded.

# Pharmaceutical Requirements

## TMX Refrigerator Thermometer



- Who use a Refrigerator thermometer?
  - Biological laboratories
  - Drug stores
- Standards:
  - DIN EN ISO 15189 - Medical laboratories - Requirements for quality and competence
  - DIN EN 13485 - Thermometers for measuring the air and product temperature for the transport, storage and distribution ...

# Pharmaceutical Requirements

## TMX Refrigerator Thermometer



- Why to buy a TMX thermometer?
  - Accoustic and optical alarm
  - Core temperature simulation with glycol bottle
  - 3 point calibration
  - Good Costs / Benefit ratio



- Acoustic Alarm
  - The acoustic alarm starts when the limit value is exceeded.
  - It can be switched off by confirming the alarm.
- Optical Alarm
  - Optical alarm will show if the limit was exceeded and stay as long as the value returns to normal.

# Cold Chain and Distribution Solutions

## - The Ebro Approach!

There are certainly a lot more important applications to discuss in the Pharmaceutical and Medical Segment of the Industry – We will be happy to share more information about those topics that we are not able to present during this webinar due to limited time.

But remember that Ebro-Xylem and its people will always have the solutions for you.

Talk to you soon.



# Thank you for your attention!

Feel free to contact us

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