

Systems

Components

Services

Facility Management

# Novartis Institutes for Biomedical Research 全球最大的制药研发中心 -- NIBR项目BMS介绍

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# The Campus Bird View



## Why NIBR project

**Part I: Complex architecture**

**Part II: Room automation integration**

**Part III: Real Energy Management**

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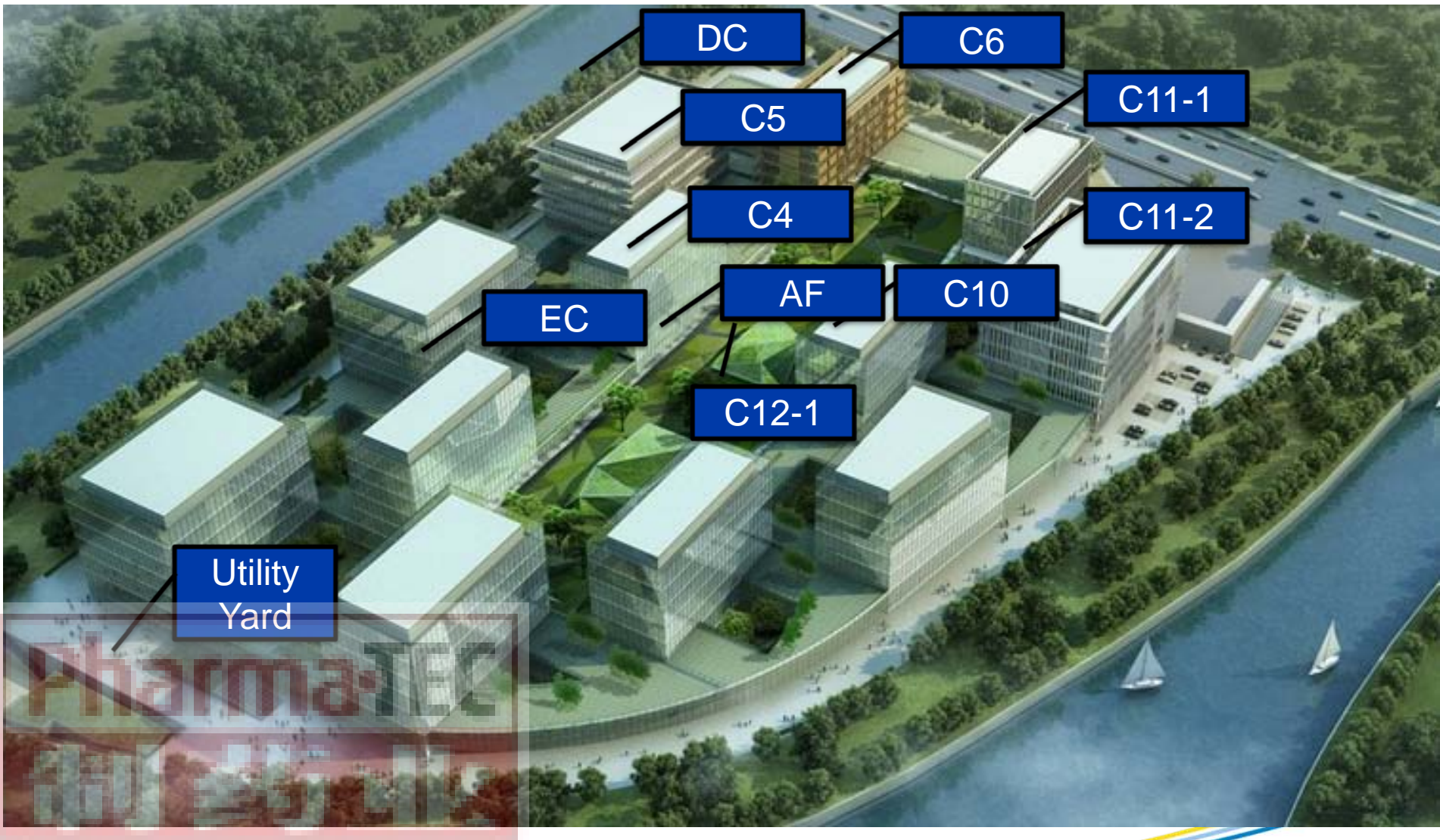
## Project Overview

### NIBR (Novartis Institutes for Biomedical Research)

#### General Information:

- **Location:** Shanghai Zhangjiang Hi-tech Park
- **Buildings:**
  - Office building: BM (Basement), C4, C6, C10, C11-1, C12-1
  - Laboratory building: C5, C11-2, BLS (Basement Lab Support)
  - Animal Facility: AF (Animal Facility)
  - Utility: EC (Energy Center), UY (Utility Yard), BSEC
  - Data Center: DC (Data Center)
- **Construction Schedule:** May, 2011 -- Oct., 2015
- **E.P.C.M. Company:** M+W Group
- **Design Company:** S2F(Jacobs), AECOM, Maison Worley, C3, etc.

# The buildings



# Highlights

- The biggest pharmaceutical R&D center worldwide
- 8 Buildings
- 150 Fume hoods
- 395 Lab rooms
- Energy management system
- Tri-generation system

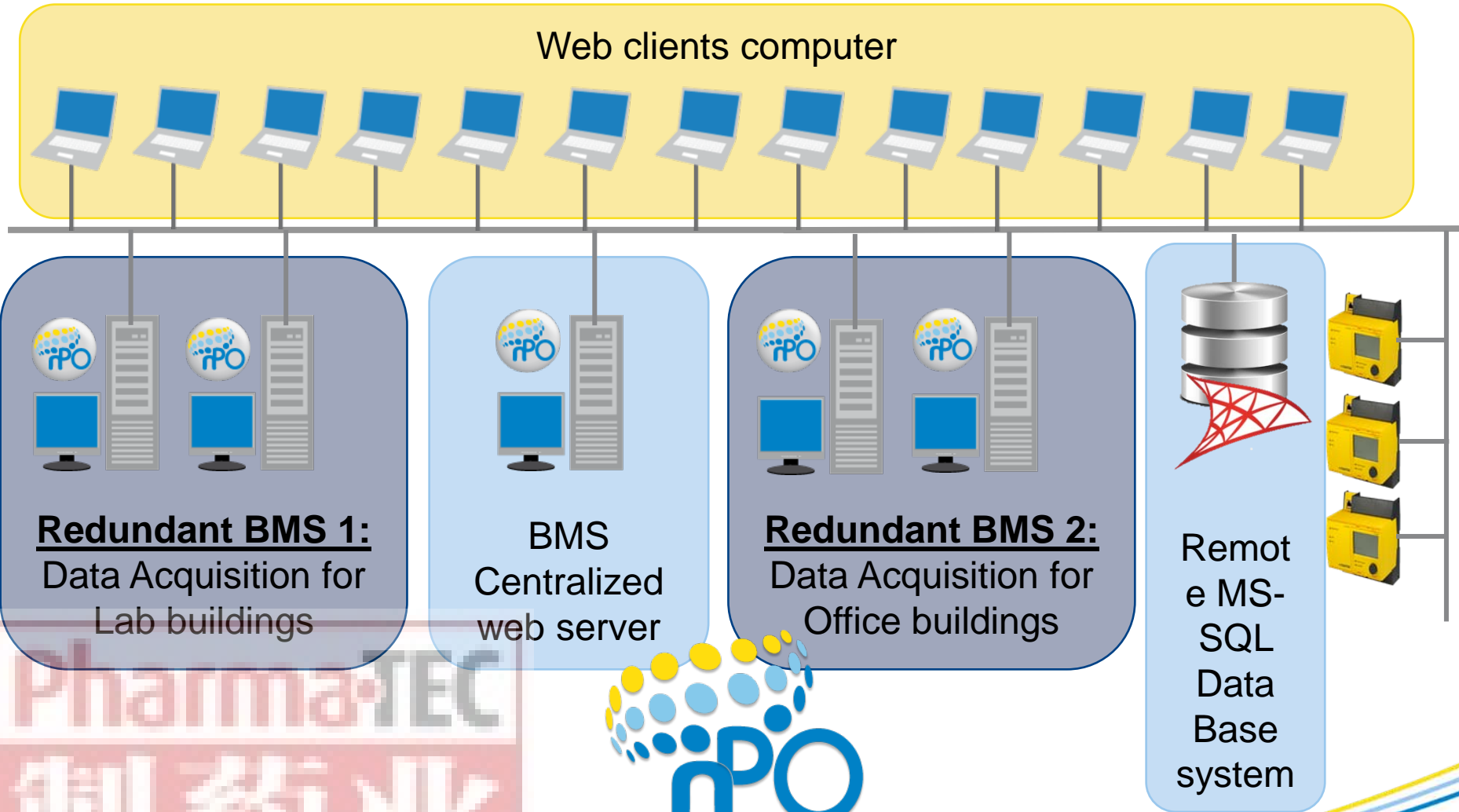
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# Highlights

- 45'000 BACnet objects
- 910 SAUTER Controller
- 401 SAUTER remote I/O boxes
- 1'126 VAV boxes with ASV controller
- 2 Master/Backup BMS systems
- 13 Web-clients



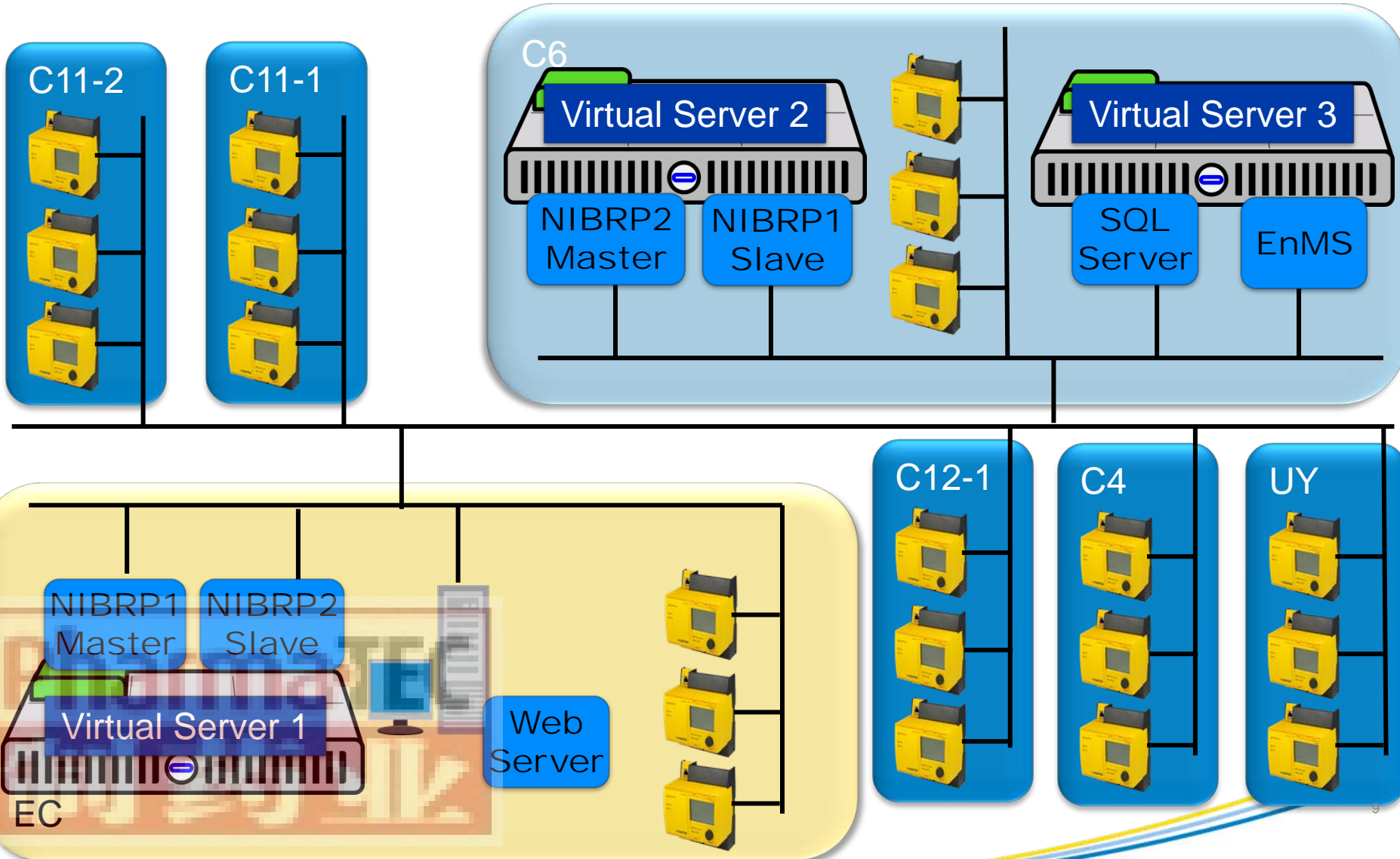
# Logical View



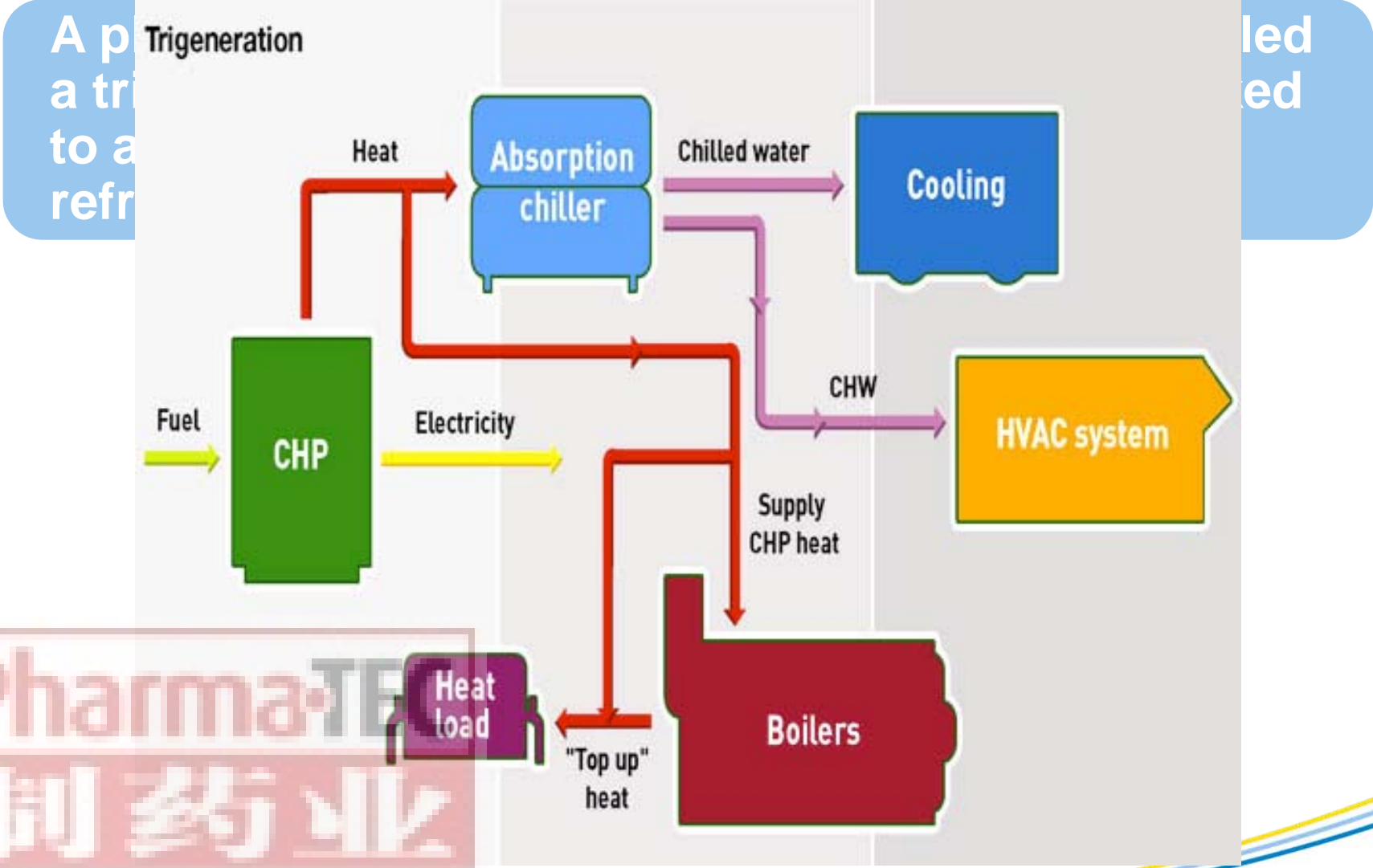
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# Network infrastructure



# Tri-generation control



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# Third party system integration for control

These systems are located at EC building. These systems are integrated into BAS via BACnet/IP protocol and/or by hard wire connection.

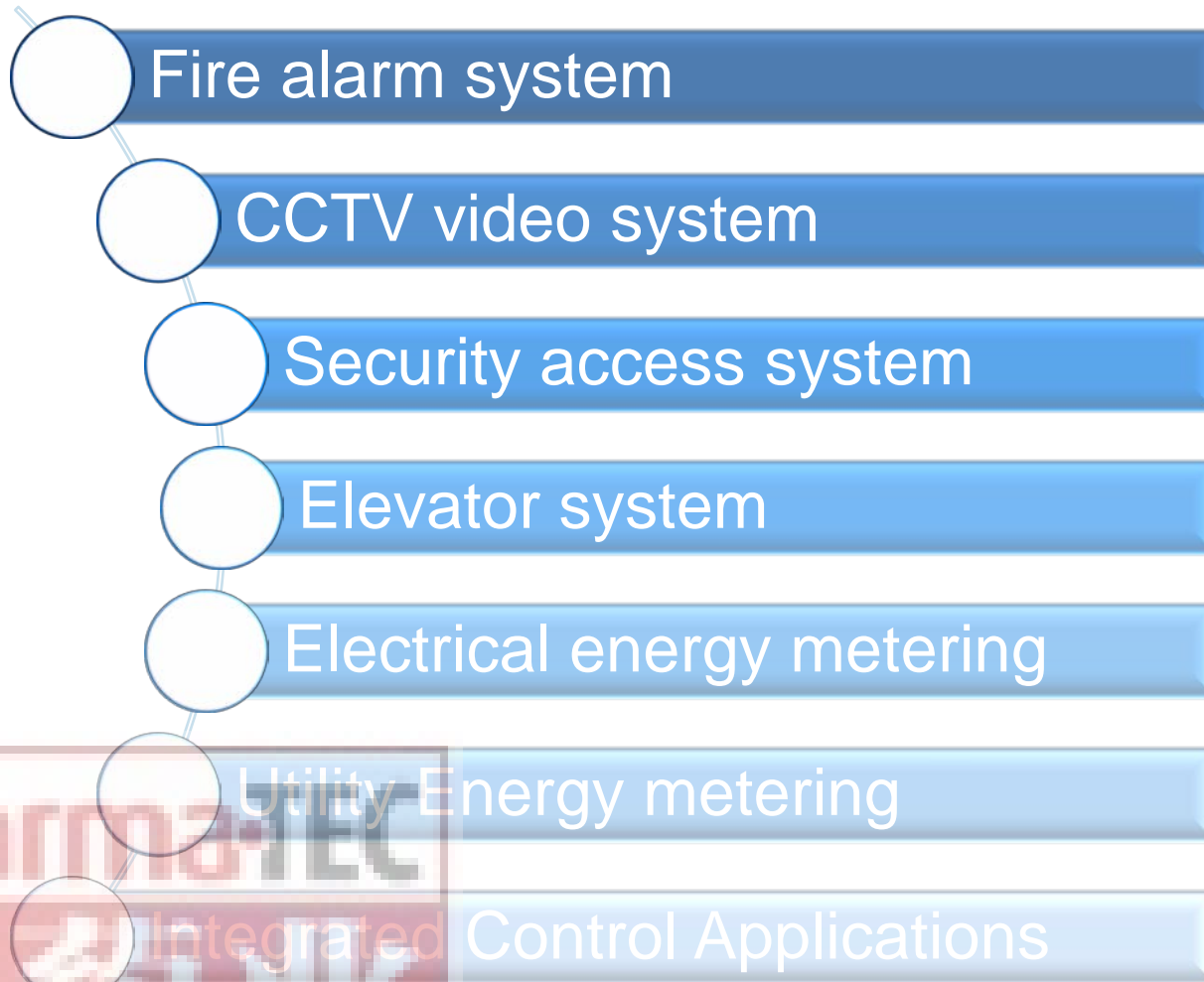
- Industrial City Water (Industrial City) Make up System
- Grey Water System
- Storm Water Collection System
- Chemical Dosing System
- Heat Exchanger system
- Compress air system
- Softened water system
- Domestic Water System
- Sanitary Sewage System



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# Third party system integration for centralization



## Why NIBR project

**Part I: Complex architecture**

**Part II: Room automation integration**

**Part III: Real Energy Management**

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# Pressure control for typical laboratory With integrated fumehood control

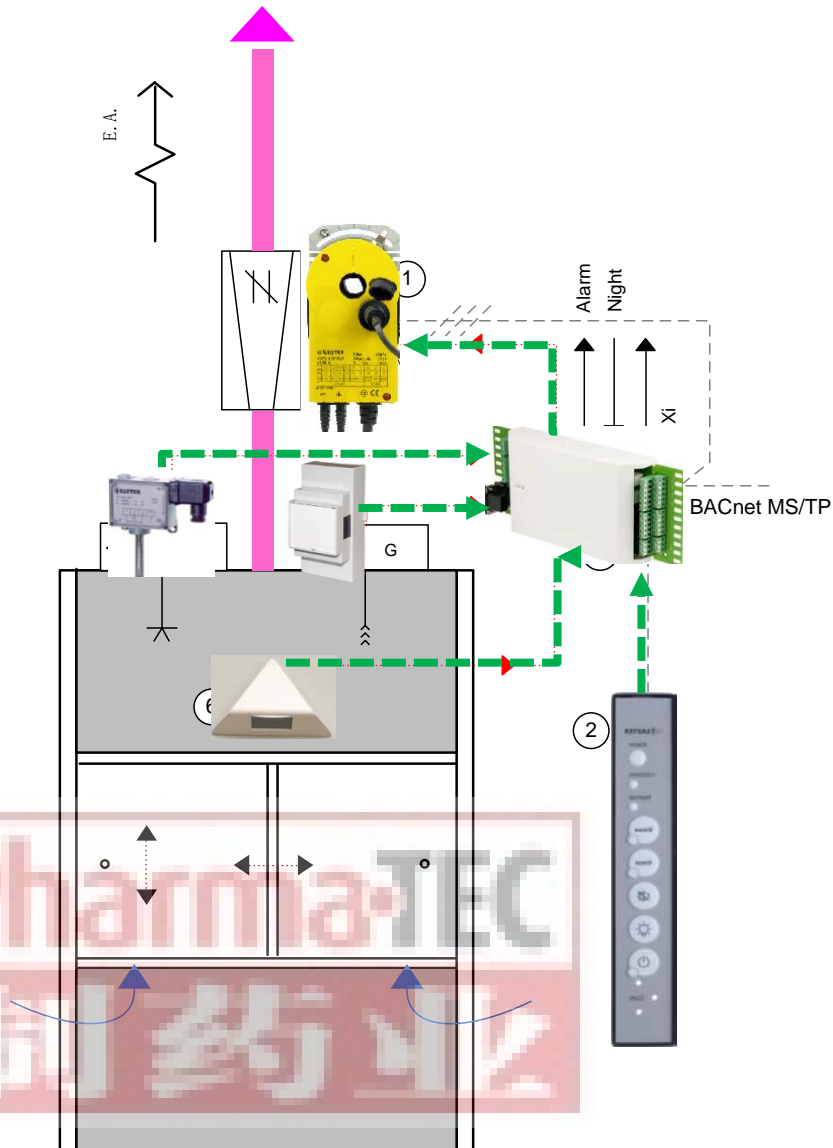
## Typical laboratory control:

- **Quantity:**  
200 laboratories rooms in AF building.
- **Requirements:**  
Room Pressure ( $\pm 5$  pascal)  
Room Air Temperature Winter optimum  $22^{\circ}\text{C}$  ( $\pm 2^{\circ}\text{C}$ )  
Summer optimum  $22^{\circ}\text{C}$  ( $\pm 2^{\circ}\text{C}$ )  
Room air relative humidity  $>35\%$  RH ( $\pm 1\%$ )

## Fumehood Control:

- **Quantity:**  
150 fumehoods in C5, C11-2, AF and BLS building.
- **Requirements:**  
Maintain a stable face velocity :  $0.5\text{m/s}$   
Energy saving with occupancy sensor
- **Control Logic:**  
Sash sensor, face velocity sensor and occupancy sensor are applied to maintain the face velocity requirement.

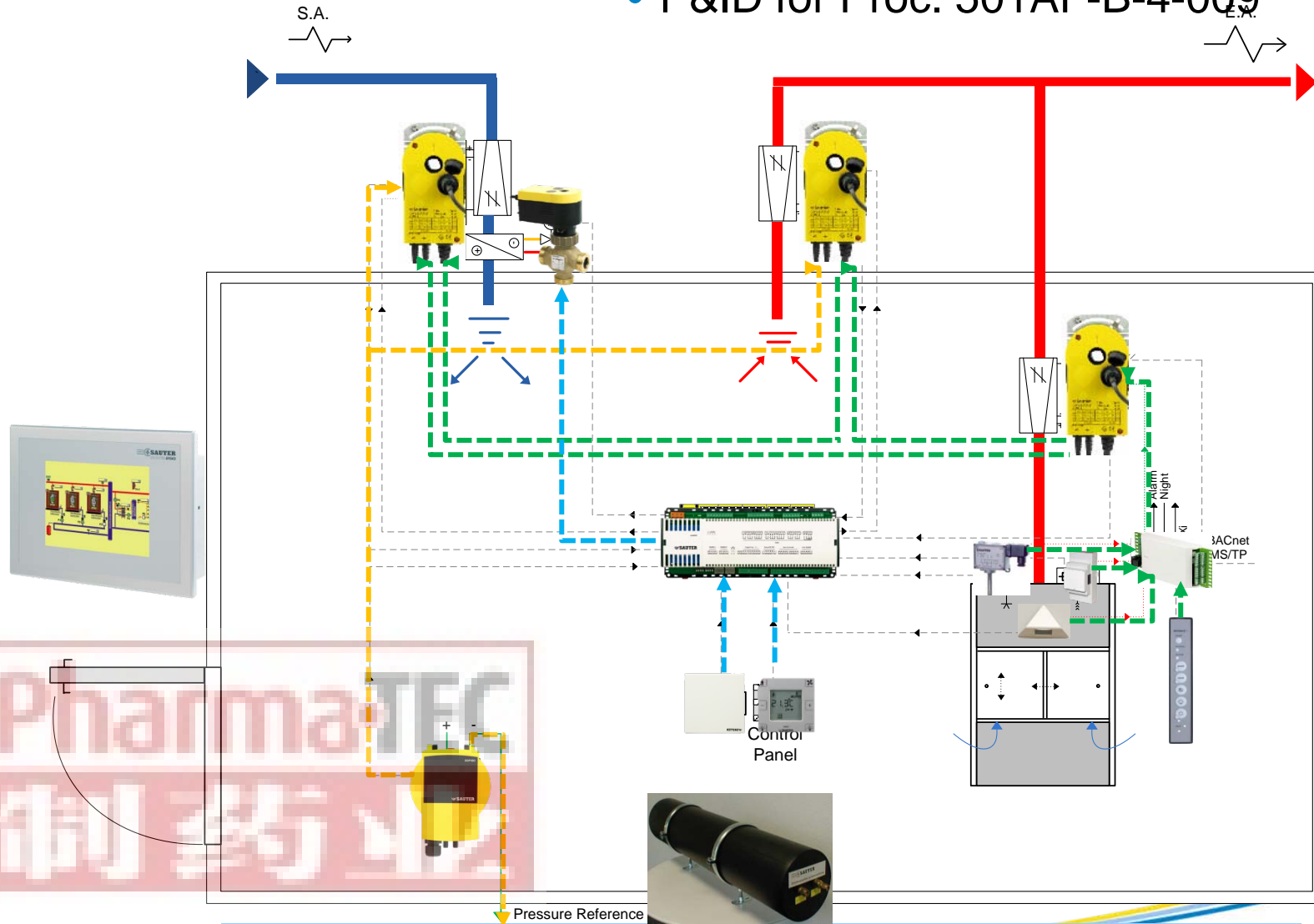
# Control and monitoring of fumehood



- Measure the opening height (4) and the air flow speed (5) at the front sash.
- Calculate the exhaust air flow volume by the VAV controller and adjust VAV box opening by fast running actuator(1).
- Continuous protect against harmful emissions by increasing the volume of the air flow when the front sash is open; maintain a face velocity in 0.5 m/s ( EN 14175)
- Occupancy sensor (6) detect the occupancy status, when there is no operator in front of fumehoods, an offset signal is triggered to maintain a face velocity in 0.3 m/s.

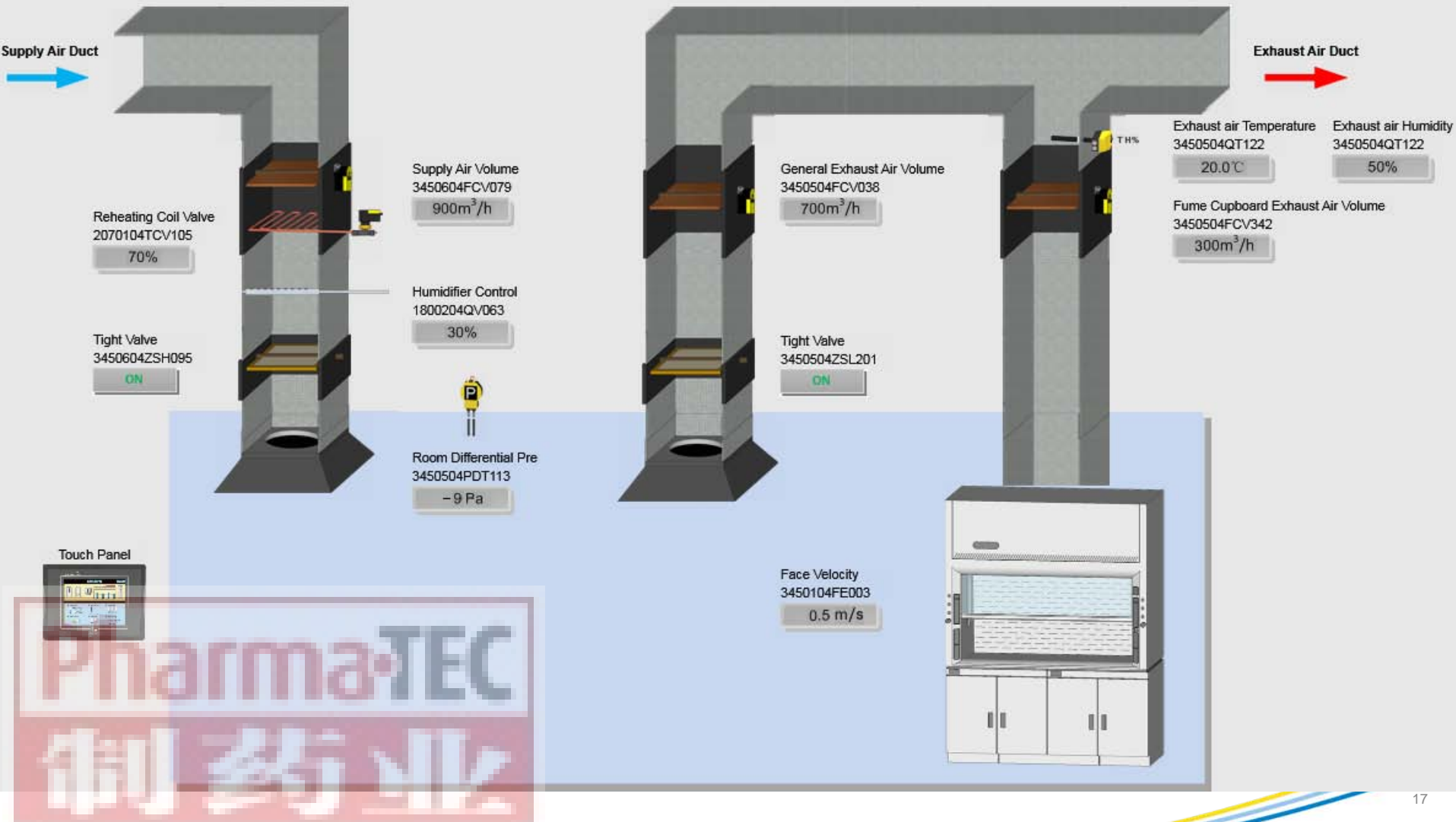
# Pressure control for typical laboratory

- P&ID for Proc. 501AF-B-4-009

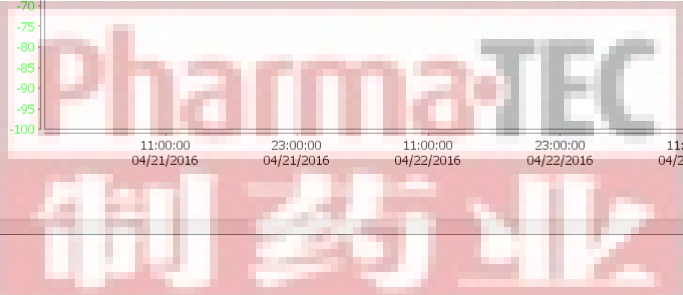
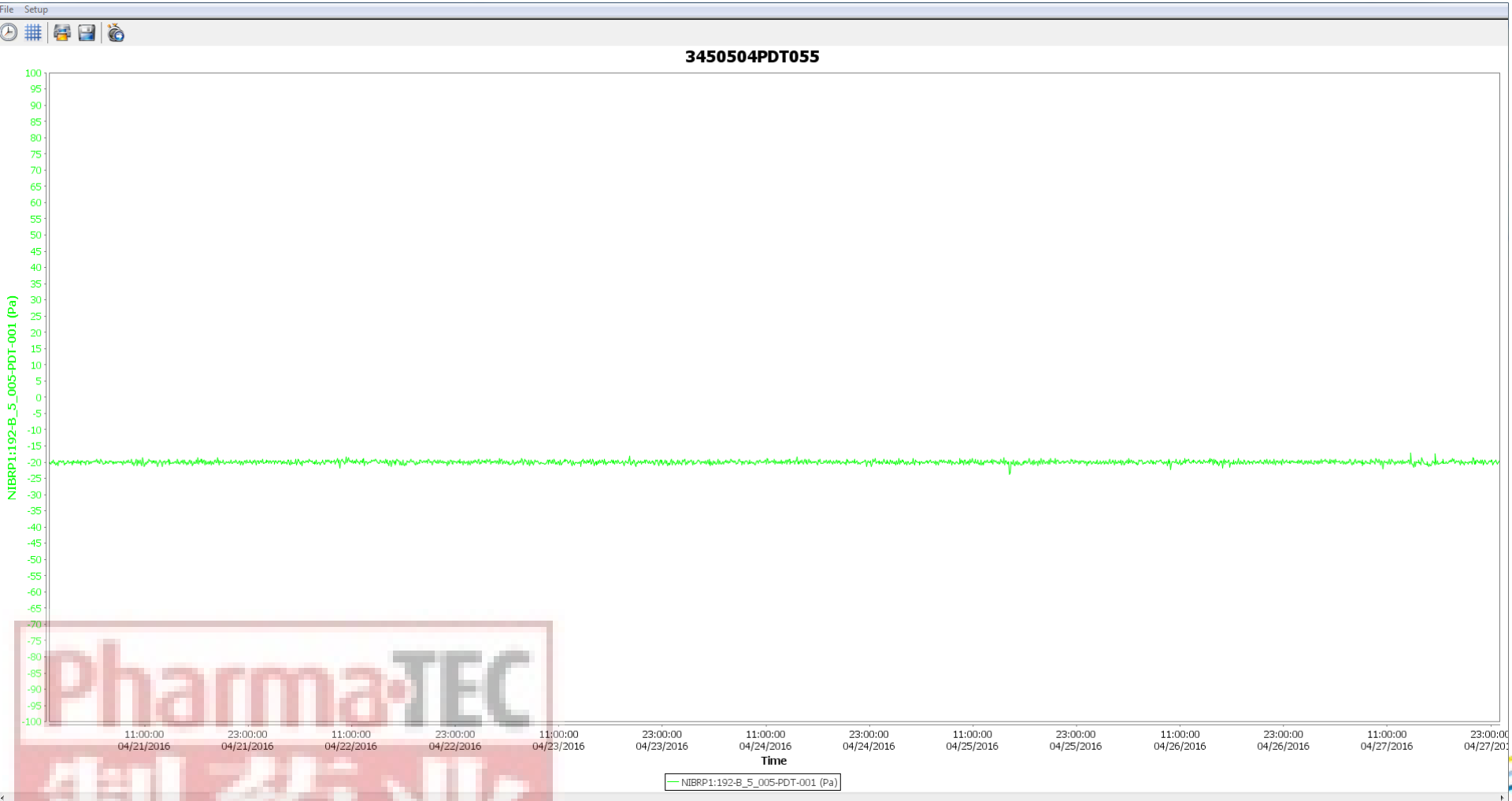




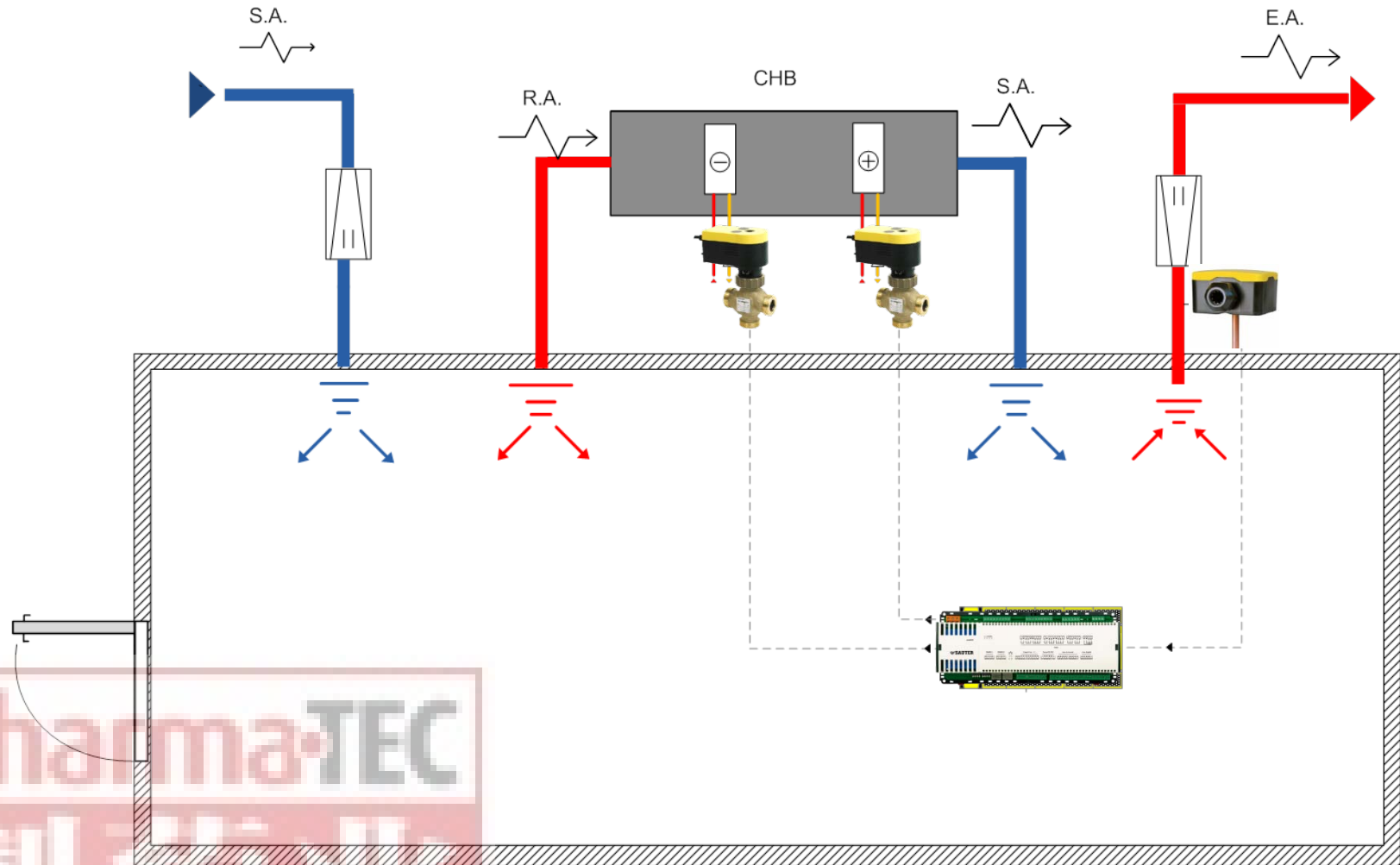
# Pressure control for typical laboratory



# A trend curve of the room pressure



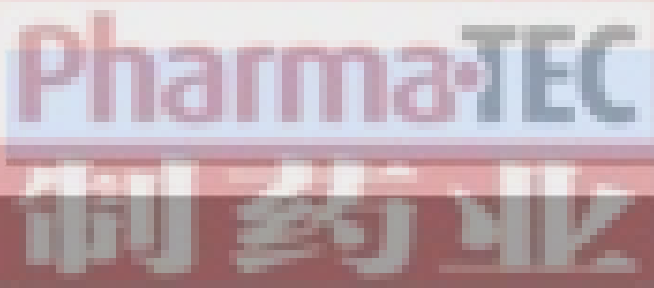
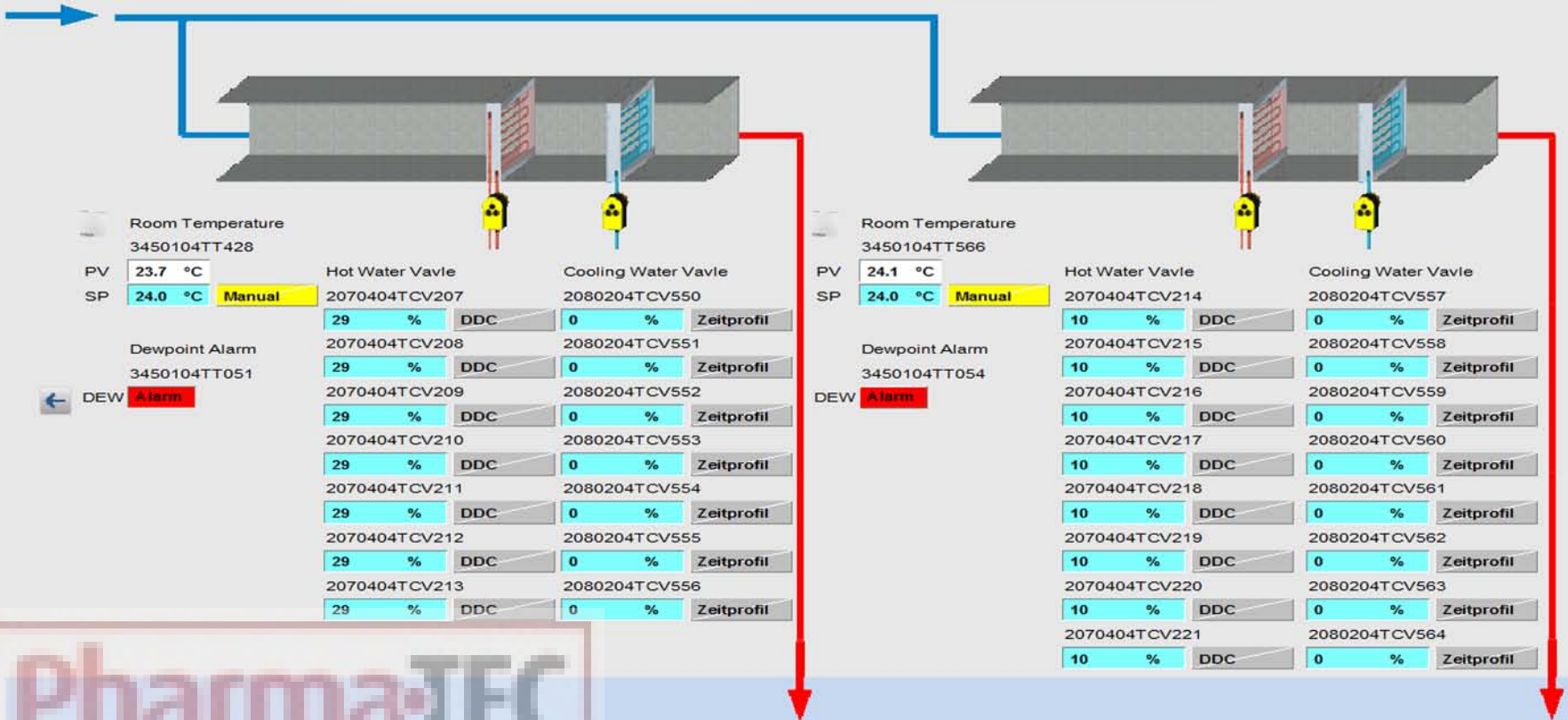
# Control for chilled beam



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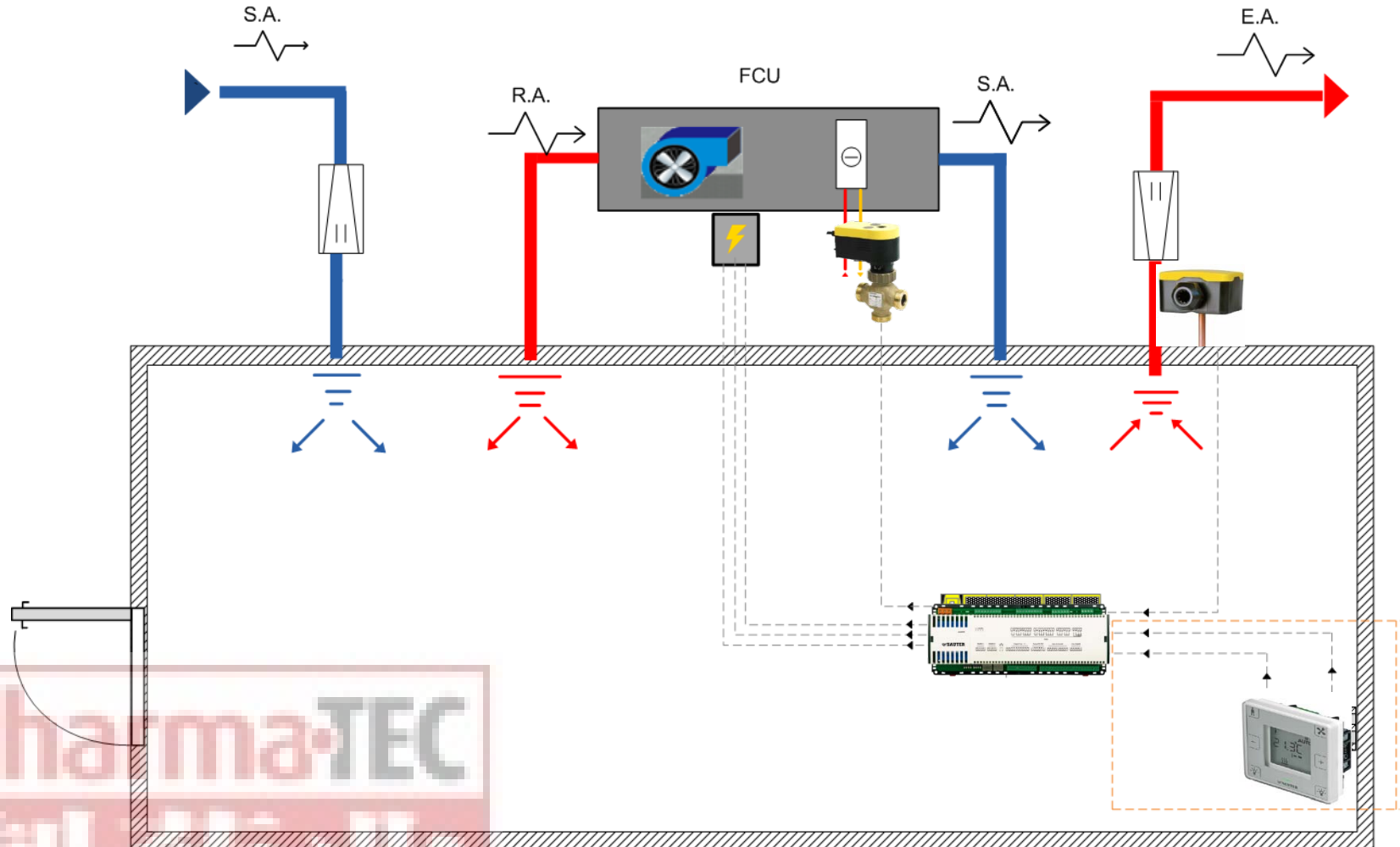
# Control for chilled beam nPO picture

NIBR Campus - C5 Lab Building - Level5 - Zone5.23 - Chilled Beam



Office Area

# Control for FCU



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# Control for FCU nPO picture

C11-2 LAB Building - HVAC System - FCU.BM.31 System

3450404TT127  
Return Air Temp.  
PV 20.5 °C  
SP 24.0 °C Default



3450407FCU857(FCU.BM.31)  
High Speed Stop  
Middle Speed Stop  
Low Speed Stop

2080204TCV068  
Cooling Water Valve Close

**VRV For BM.31**

Room Temperature

PV 18.0 °C  
SP 20.0 °C Default

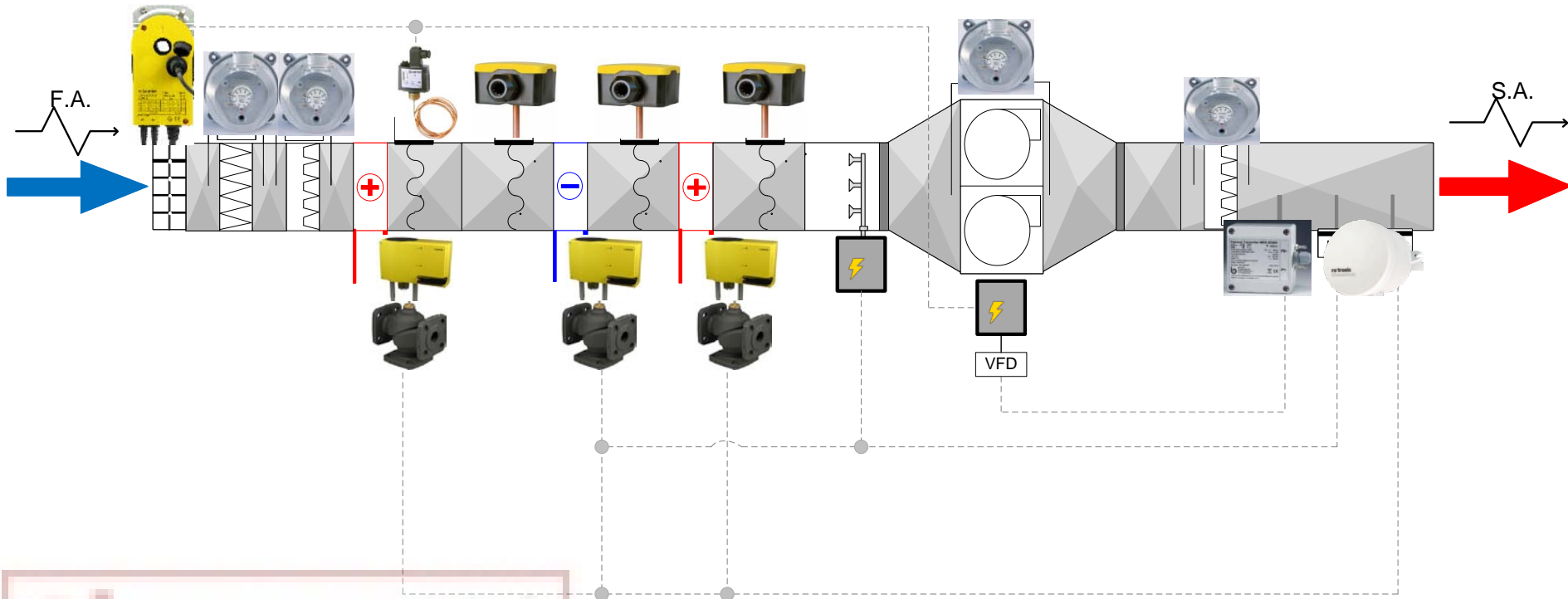
Status Stop  
CMD Stop Default  
Filter Normal  
Reset Normal Default  
Error Mute

**ZONE BM.31**  
IT ROOM  
ELV ROOM

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**FCU.B.31 System**

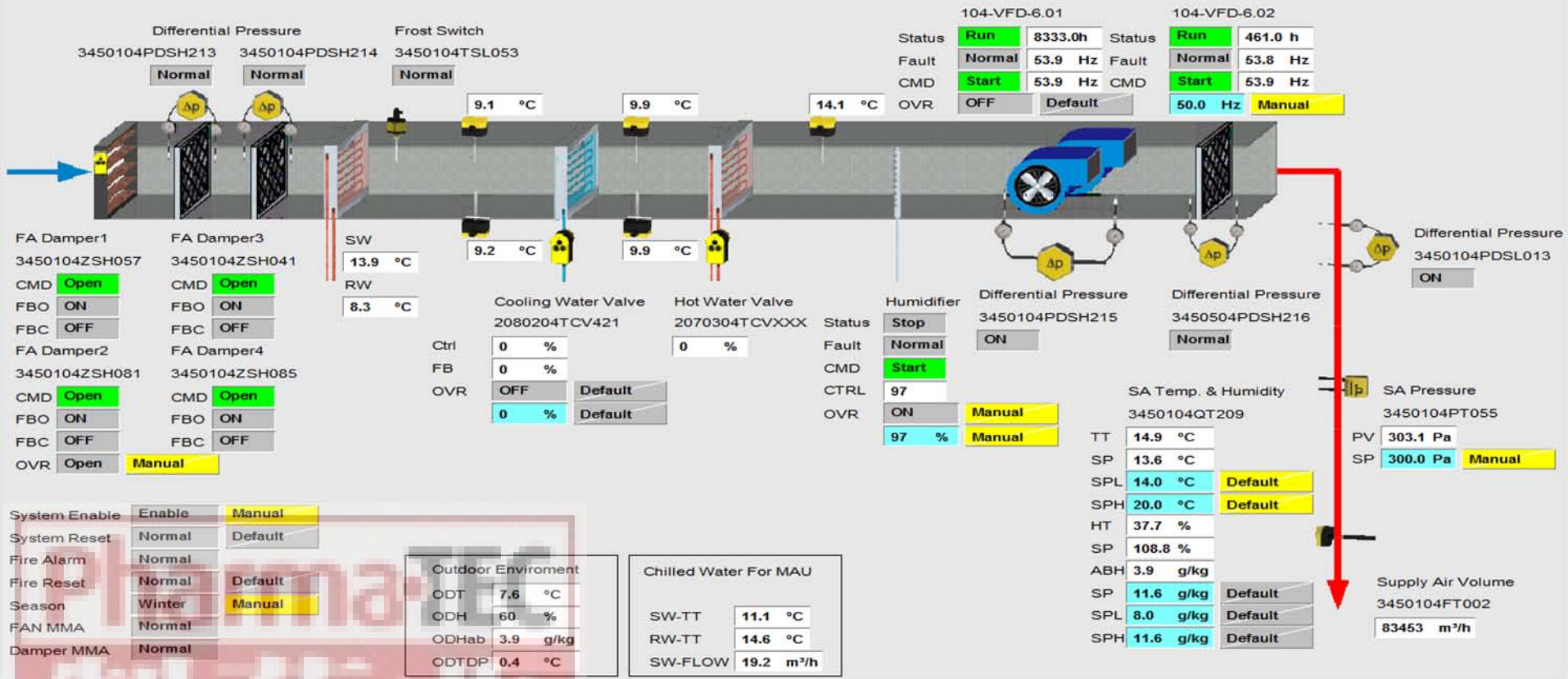
# Control for AHU



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# Control for AHU nPO picture

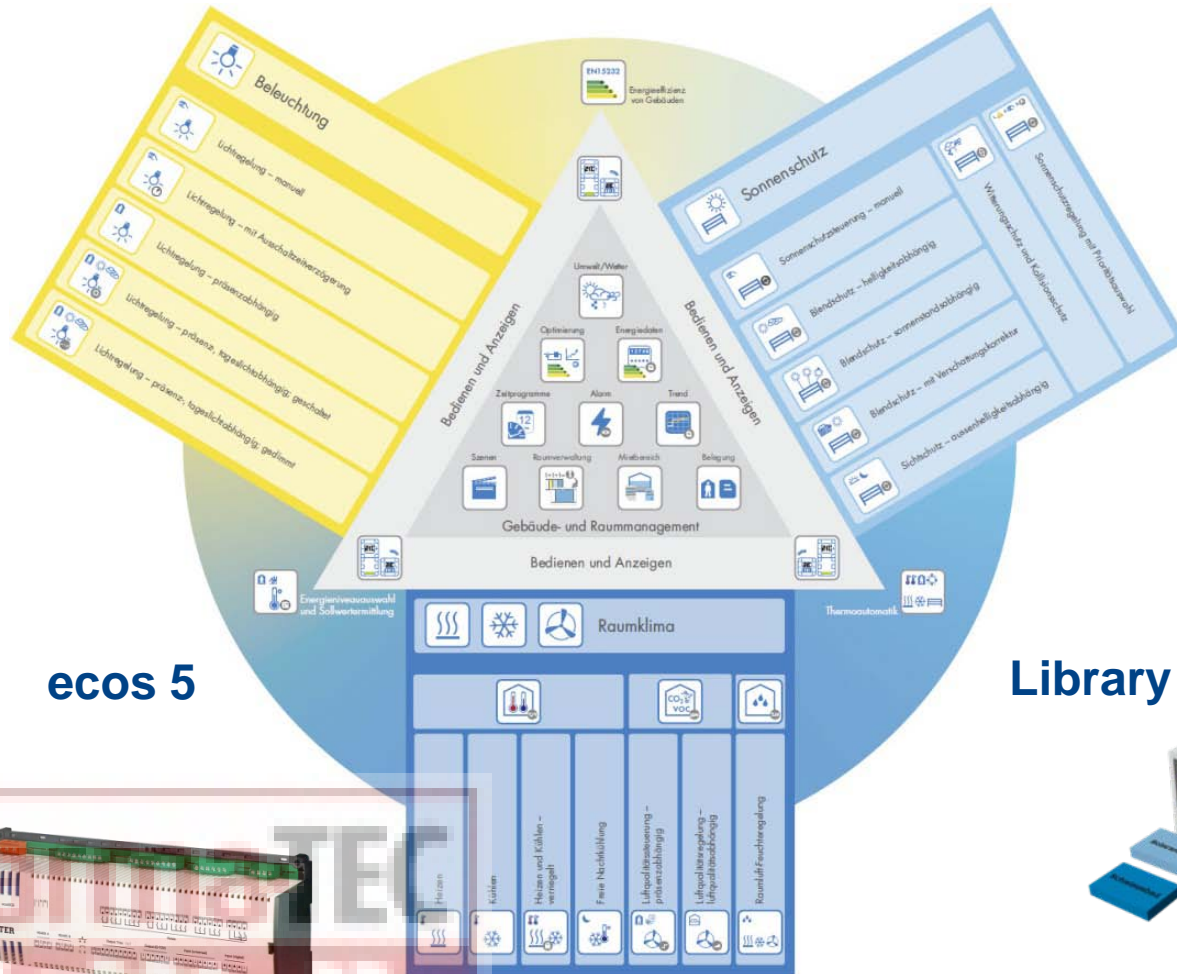
NIBR Campus - C5 Lab Building - HVAC System - MAU 6.01



Lab Building Level 1~5

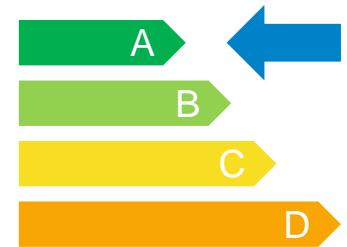


# SAUTER Room Automation



**ecos 5**

- Solution libraries based on
  - EN15232
  - VDI3813

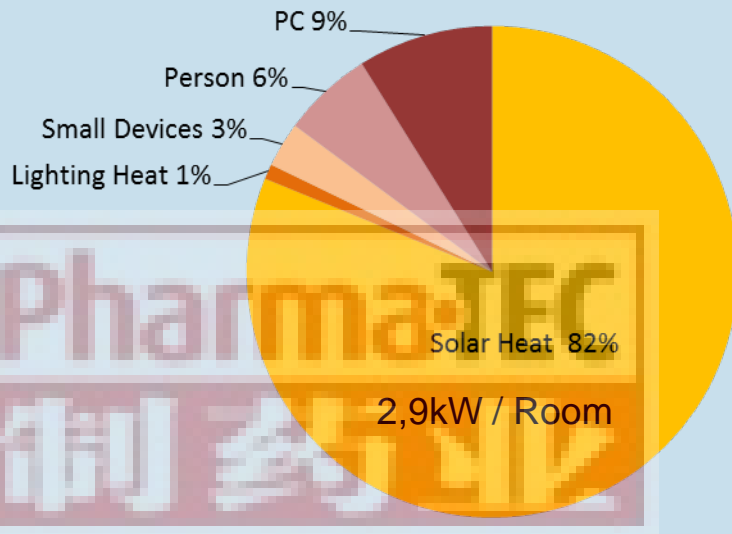


**Library solution for climate**

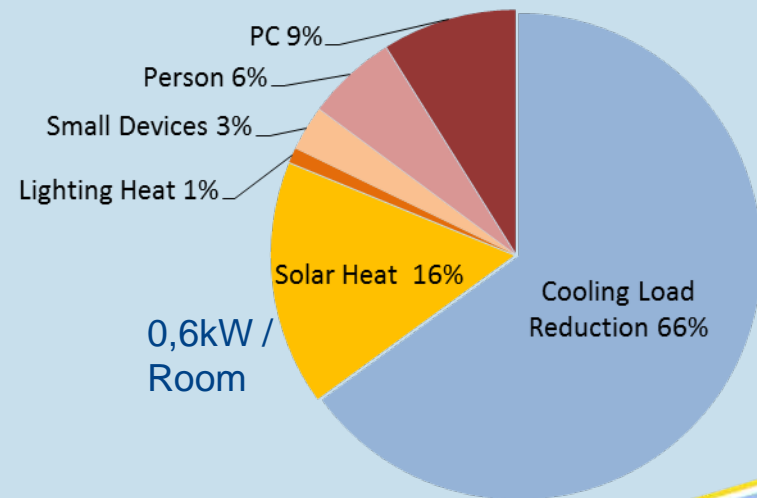


# Solar protection = Passive cooling technology

## Without solar protection

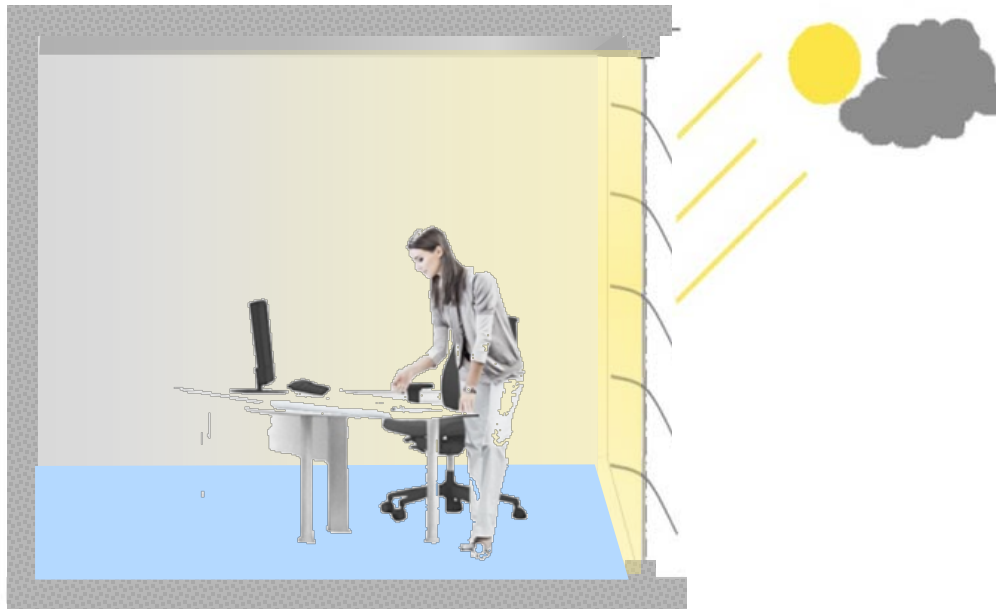


## With solar protection



# Solar protection functions

## Solar heating protection



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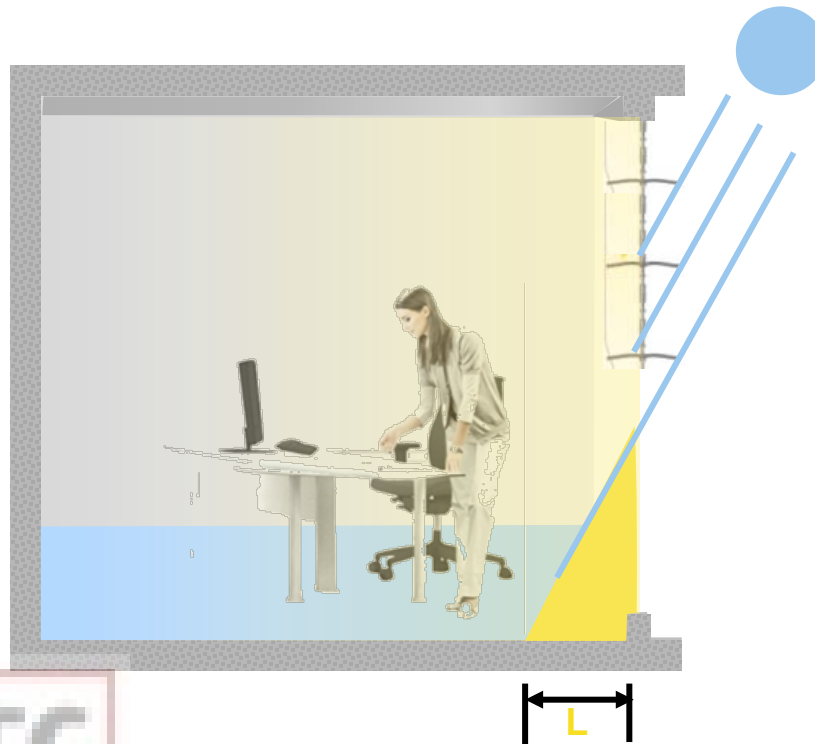
# Solar protection functions Adapted with the sun position



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# Solar protection functions

## Light for your flowers

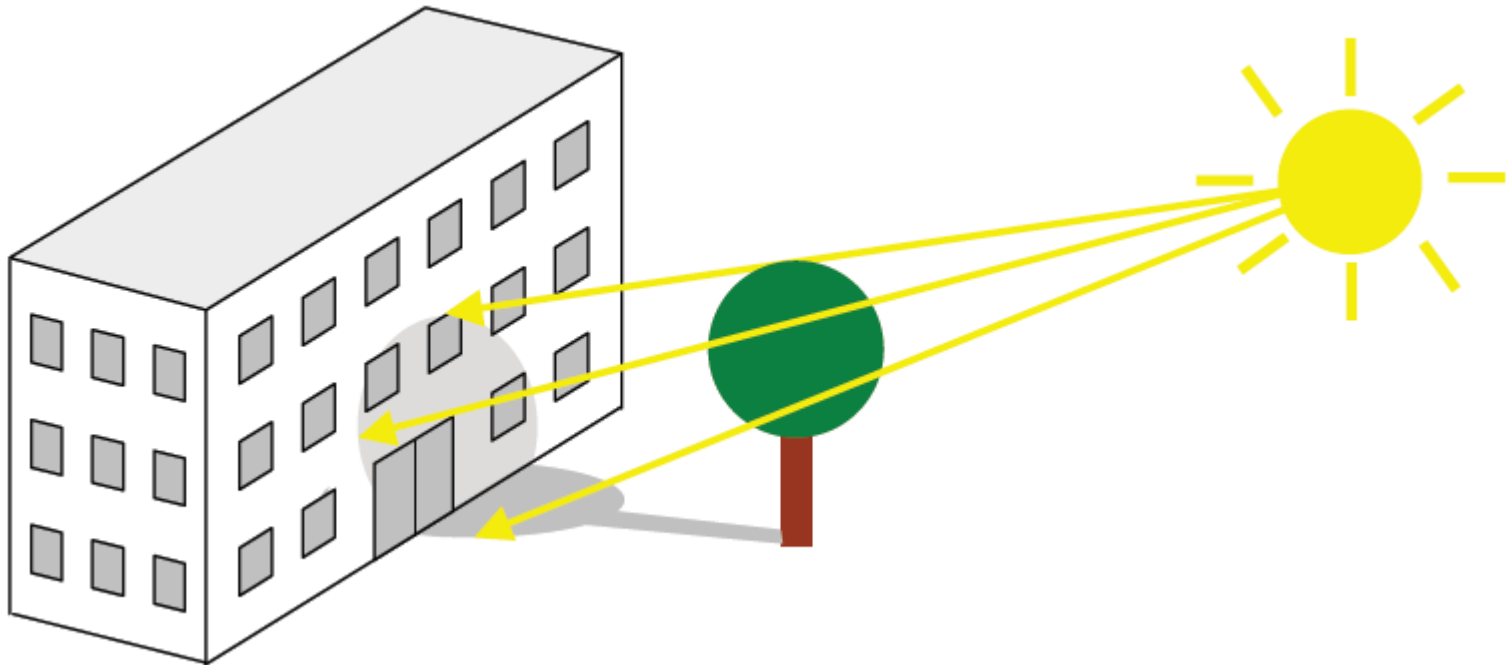


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# Solar protection functions

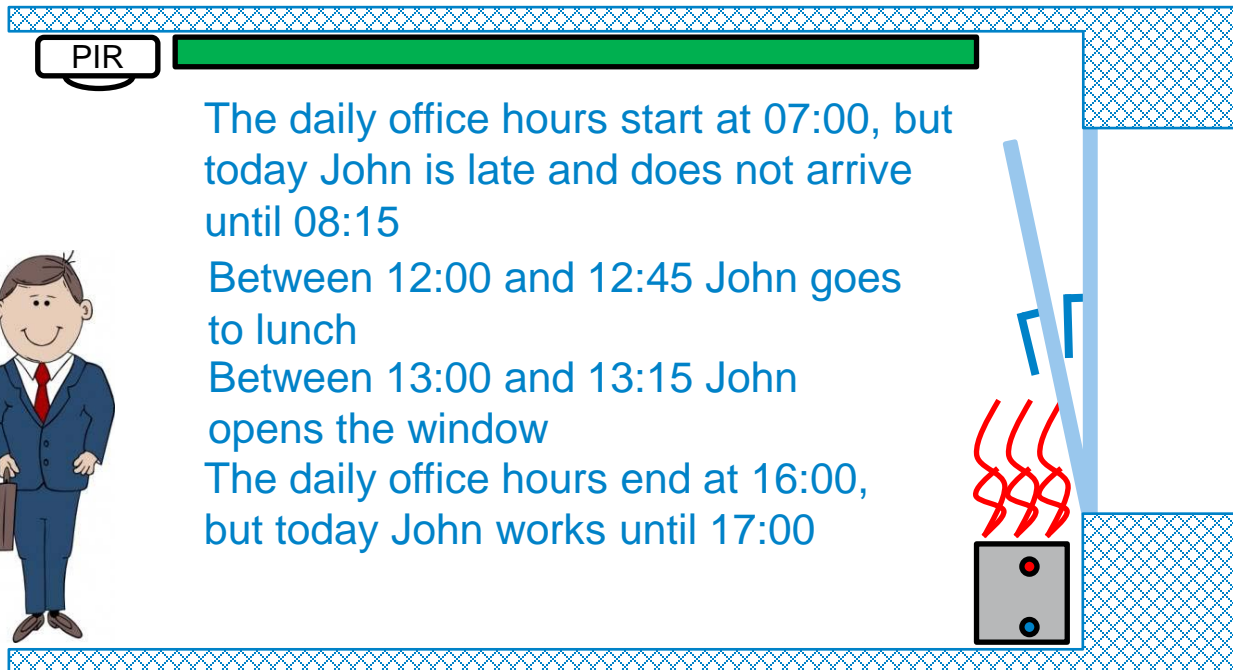
## Shadow correction



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# Room Automation

## A typical day in John's office



Energy mode :

- Comfort
- Pre-comfort
- **Economy**
- Protection

Occupancy time schedule :

- **Absence**
- Presence

Real occupancy :

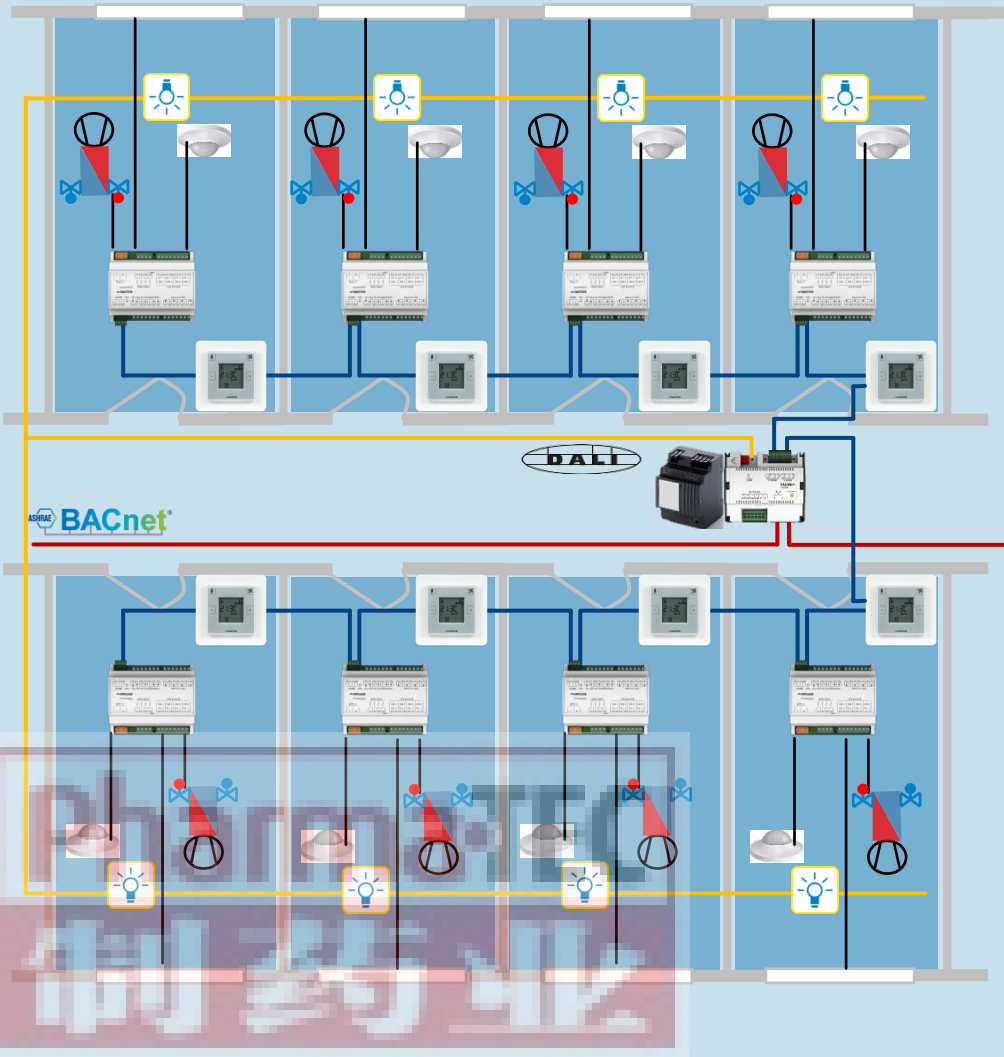
- **Absence**
- Presence

Window :

- **Closed**
- Opened

# ecos504 use

## Easy room climate regulation



### Function

- 8 fixed rooms
- Room climate with fan coil
- Occupancy control
- Window contacts
- Dew point sensor
- Light dimming management
- Blind management depending on sun position
- Weather station



# ecoUnit 1 Room Control Units 2nd Generation

Conditions of use in a weekly cycle

- Minimum illuminance:

EY-RU14\*: 250 lx, 5 h (1250 lx \* h daily)

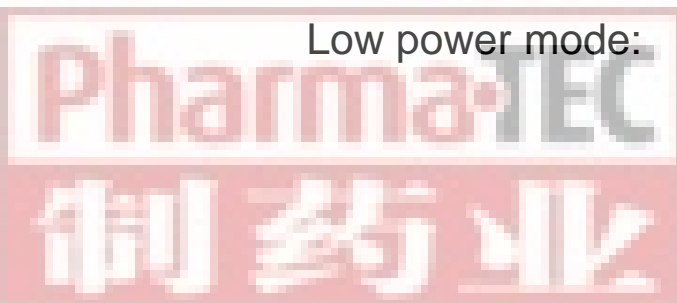
EY-RU14\* + EY-SU106: **125 lx, 5 h (625 lx \* h daily)**  
5 days illumination, 2 days dark phase

- Backup period in darkness:

Full function: **60 h (2.5 days)**

Low power mode: **Additional 60 h (2.5 days)**

Pushbutton Light/blinds  
Temperature measurement with reduced cycle  
No setpoint adjustment



## Why NIBR project

**Part I: Complex architecture**

**Part II: Room automation integration**

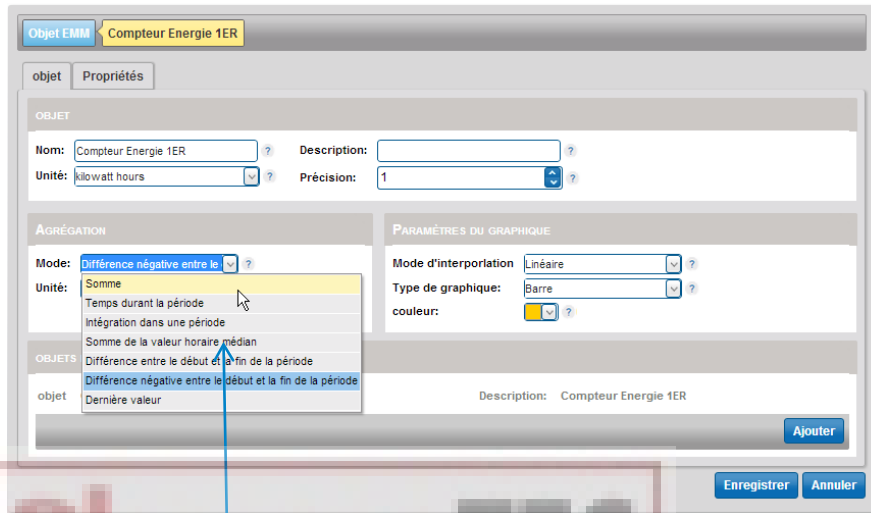
**Part III: Real Energy Management**

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# What is the Energy Monitoring

An Energy Module displays the energy consumption of the building.



The screenshot shows the configuration page for 'Objet EMM - Compteur Energie 1ER'. It includes fields for 'Nom' (Compteur Energie 1ER), 'Description', 'Unité' (kilowatt hours), and 'Précision' (1). The 'AGREGATION' section has a 'Mode' dropdown set to 'Différence négative entre le début et la fin de la période'. A mouse cursor is pointing at this dropdown, which has opened a list of options: 'Somme', 'Temps durant la période', 'Intégration dans une période', 'Somme de la valeur horaire médian', 'Différence entre le début et la fin de la période', 'Différence négative entre le début et la fin de la période', and 'Dernière valeur'. The 'PARAMÈTRES DU GRAPHIQUE' section shows 'Mode d'interpolation' set to 'Linéaire', 'Type de graphique' set to 'Barre', and 'couleur' set to yellow. There are 'Ajouter', 'Enregistrer', and 'Annuler' buttons at the bottom.

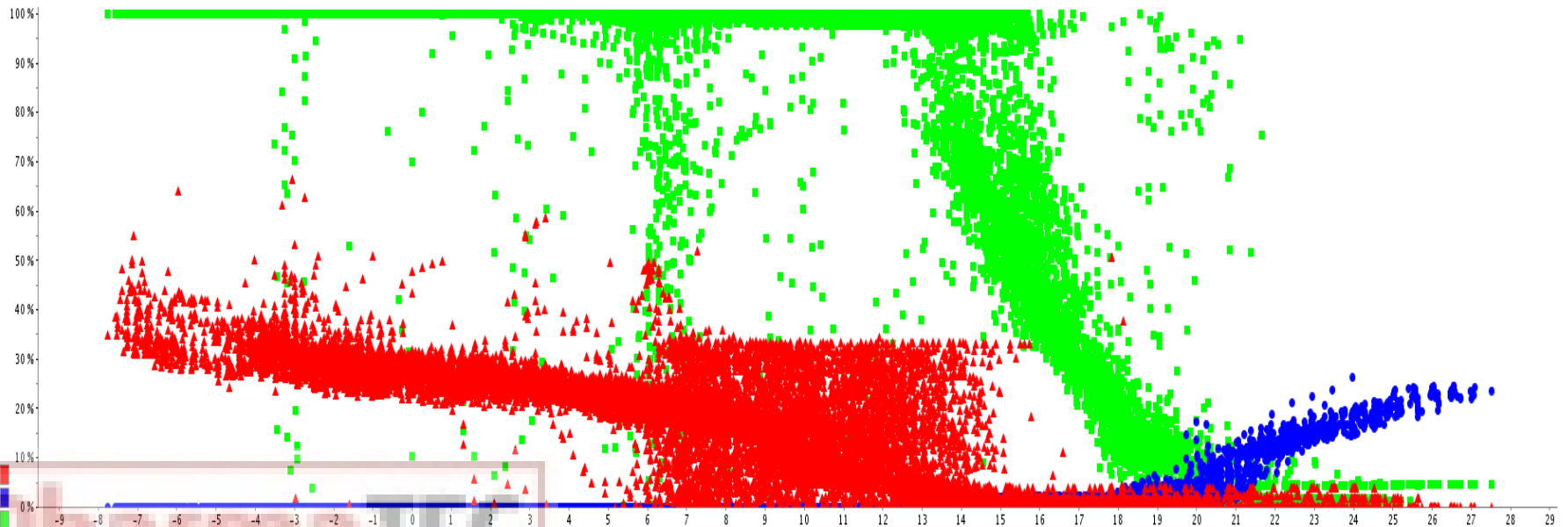
List of possible aggregations



Using EMM data in two graphs of an SVC report

# Understand your building to save energy!

## Statistical evaluation of positioning signals depending on the outside air temperature

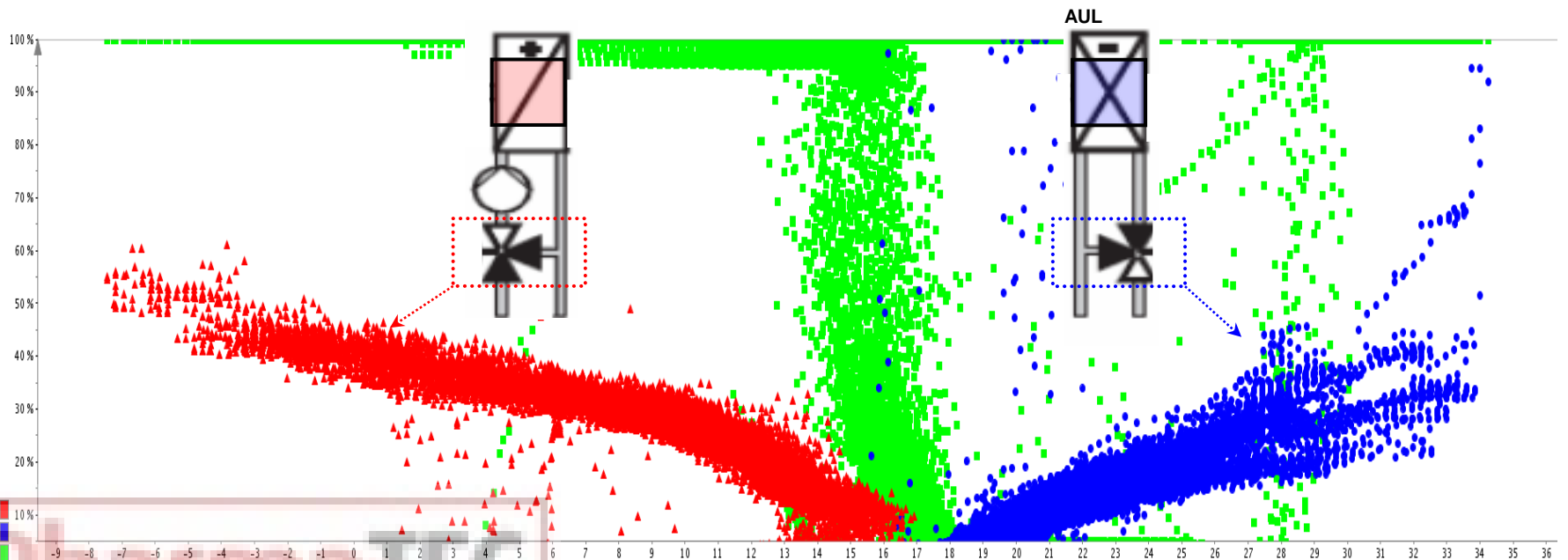


Colour Data point description

Red AOLK valve [%]  
Blue AOLK valve [%]  
Green AO WRG pump [%]

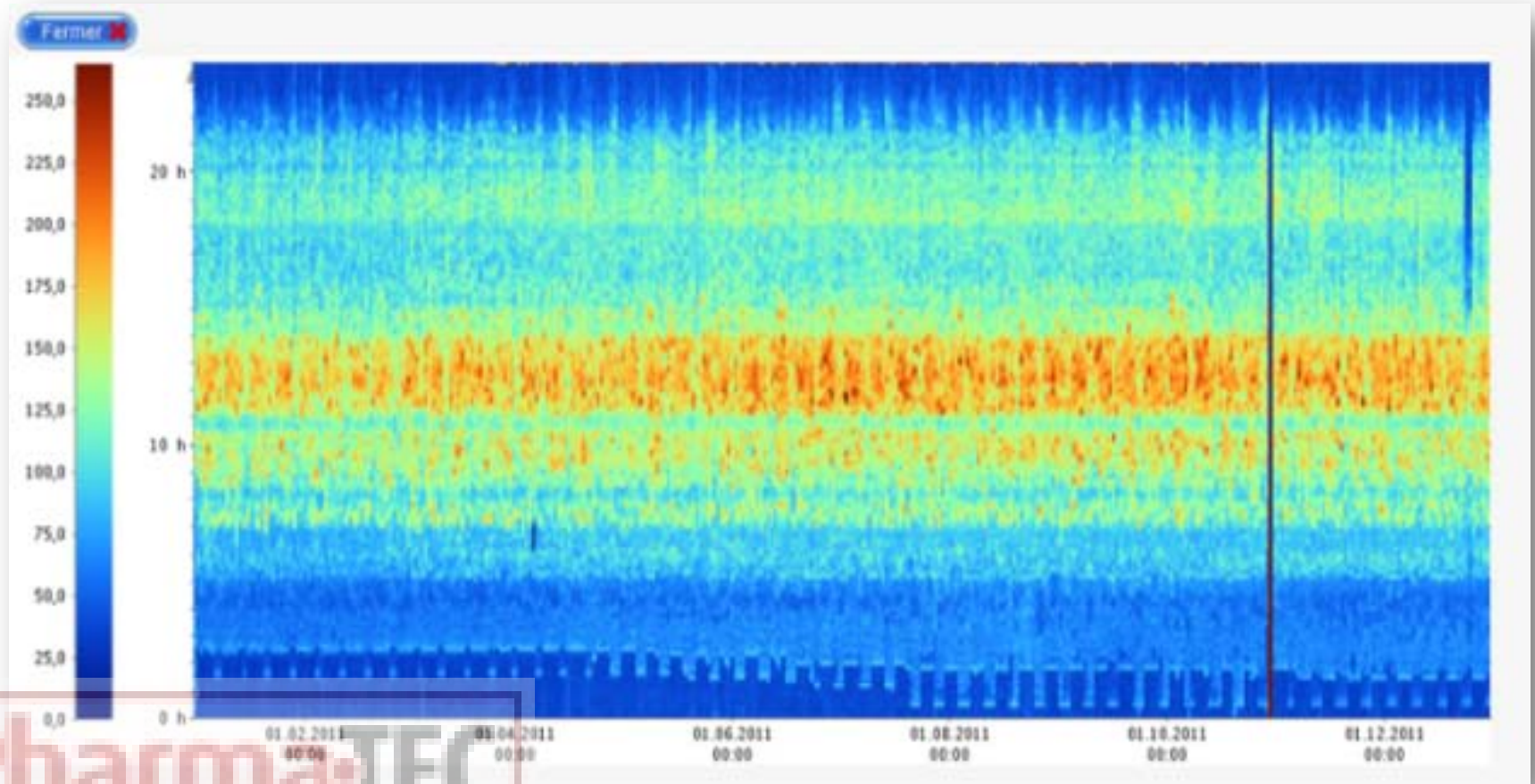
# Understand your building to save energy!

## Statistical evaluation of positioning signals depending on the outside air temperature



Colour	Data point description
Red	AOLK valve [%]
Blue	AOLK valve [%]
Green	AOLK valve [%]

# Understand your building to save energy!



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# No clue, please help me !

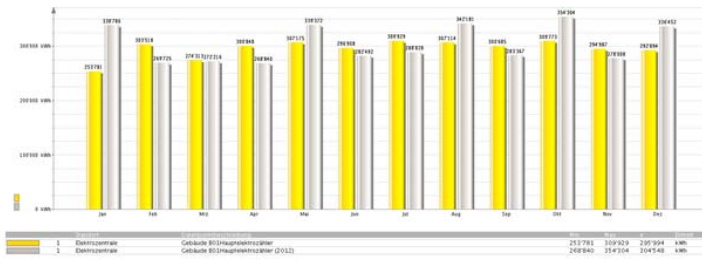


Abbildung 7: Elektroenergie [kWh] aktuelles Jahr Vergleich mit Vorjahr

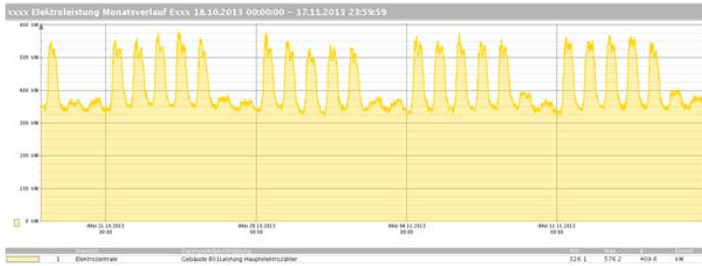
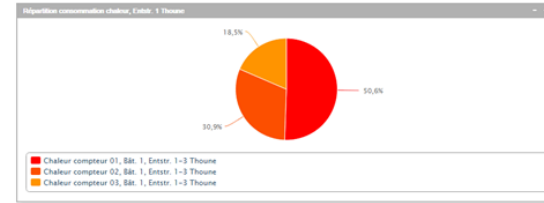


Abbildung 8: Elektroleistung [kW], Monatsverlauf



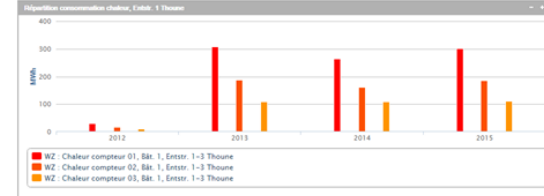
Abbildung 9: Elektroenergie HAT + NT [kWh], aktuelles Jahr gestopelt

## 1. Graphique circulaire répartition consommation entre différents compteurs d'un certain type dans un bâtiment



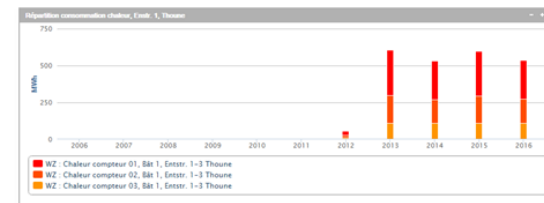
Année en cours / derniers 365 jours / année dernière

## 2. Barre consommation annuelle des différents compteurs d'un certain type dans un bâtiment



10 dernières années, incl. année en cours

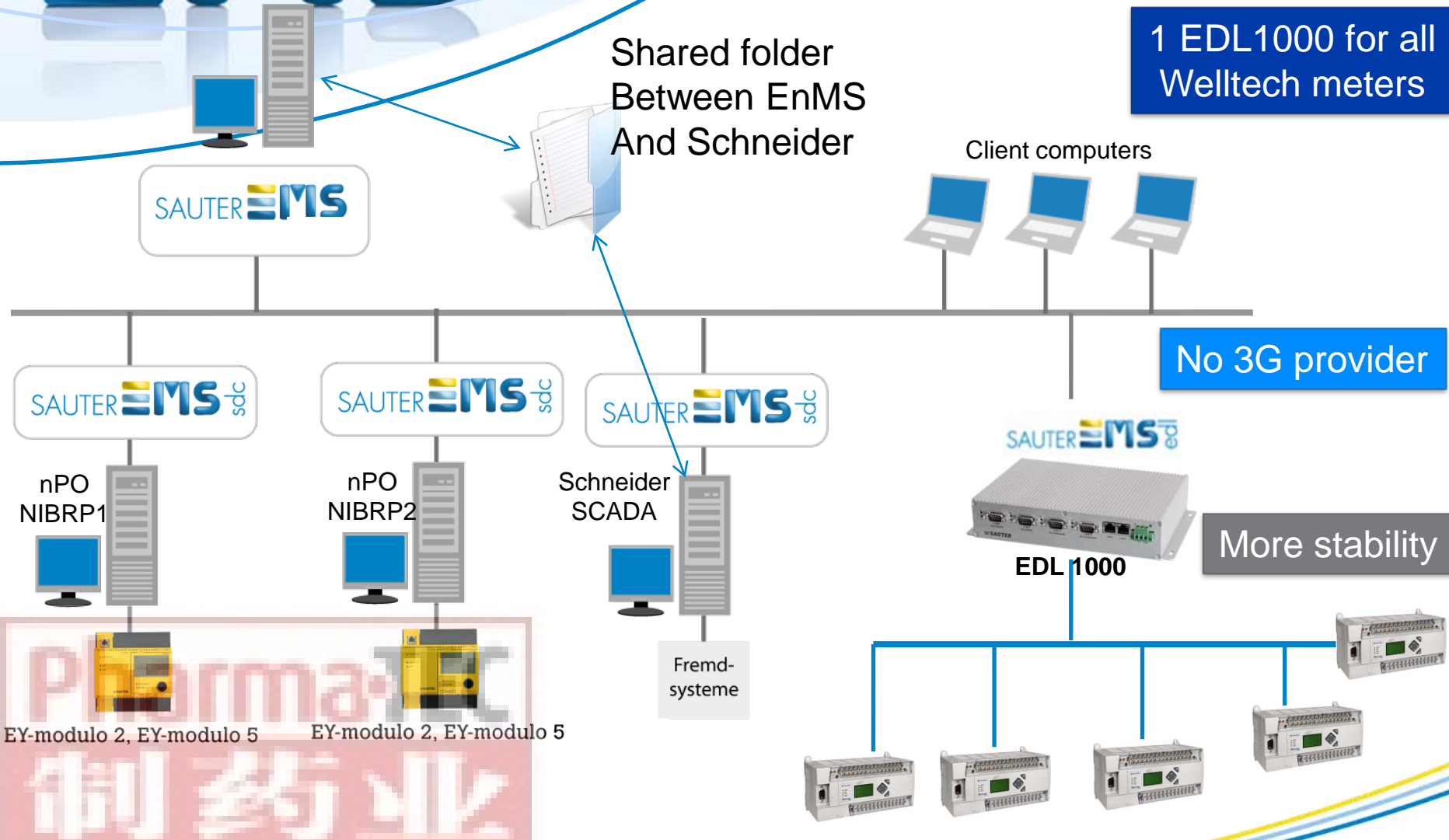
## 3. Barre empilée consommation annuelle des différents compteurs d'un certain type dans un bâtiment



10 dernières années, incl. année en cours

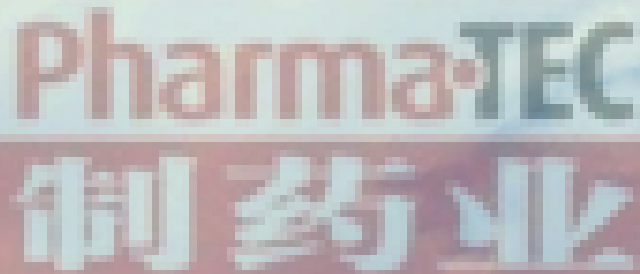
# EMS

## NIBR in Shanghai





**Some site pictures!**



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# Site pictures



# Site pictures



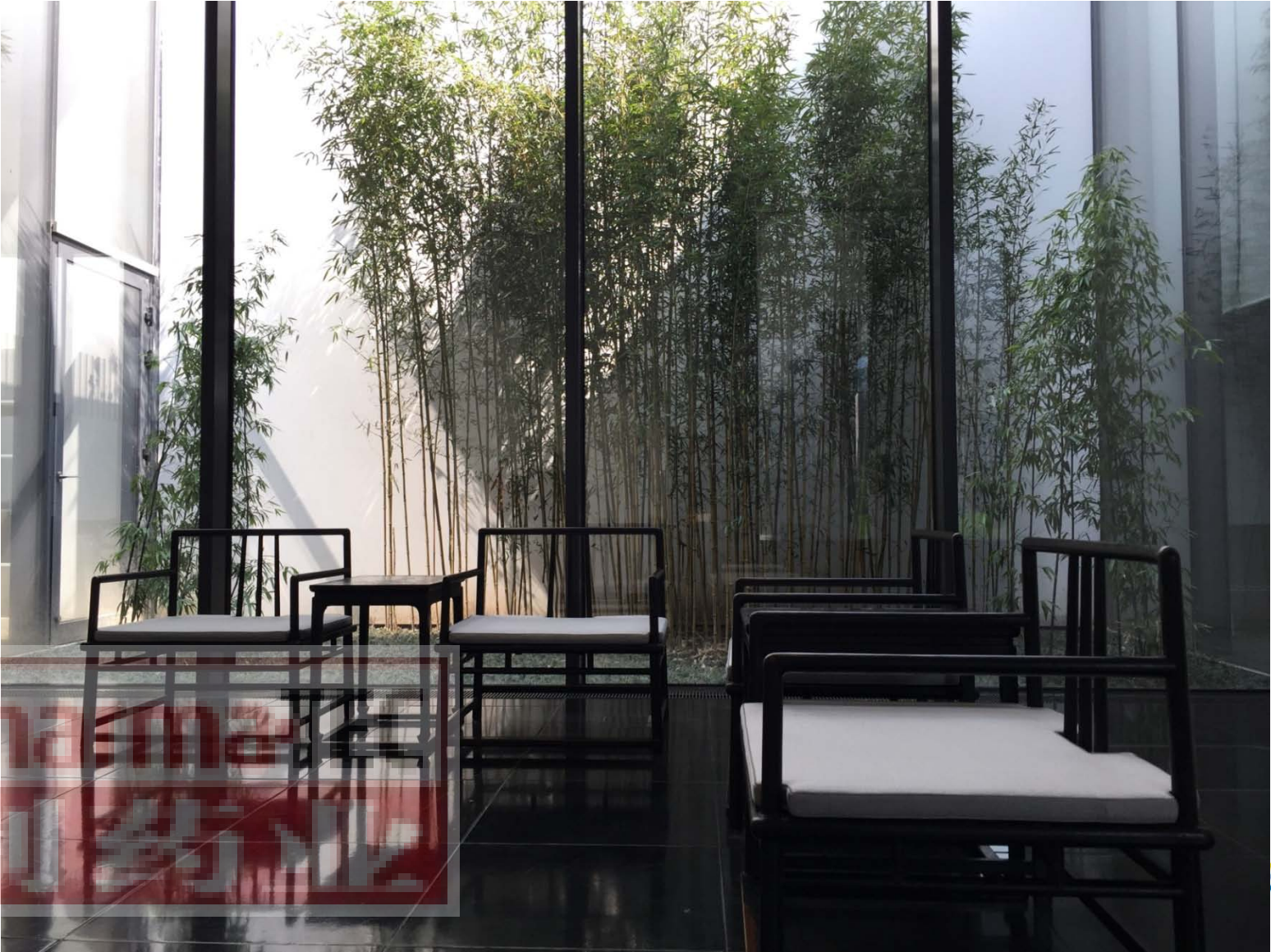
# Site pictures



# Site pictures



# Site pictures



# Site pictures



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# Site pictures





# Site pictures



# Site pictures



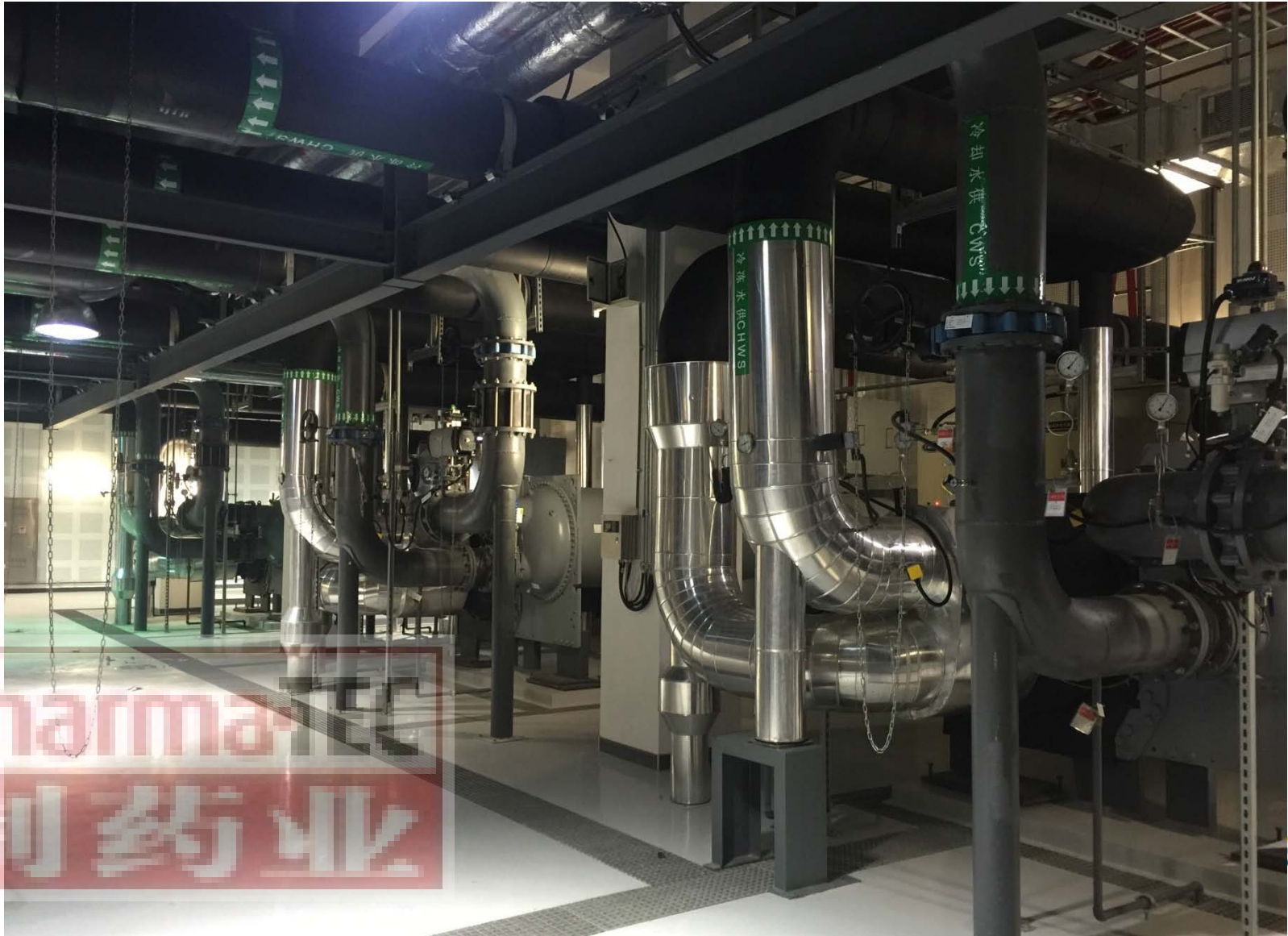
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# Site pictures



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# Site pictures



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# Site pictures

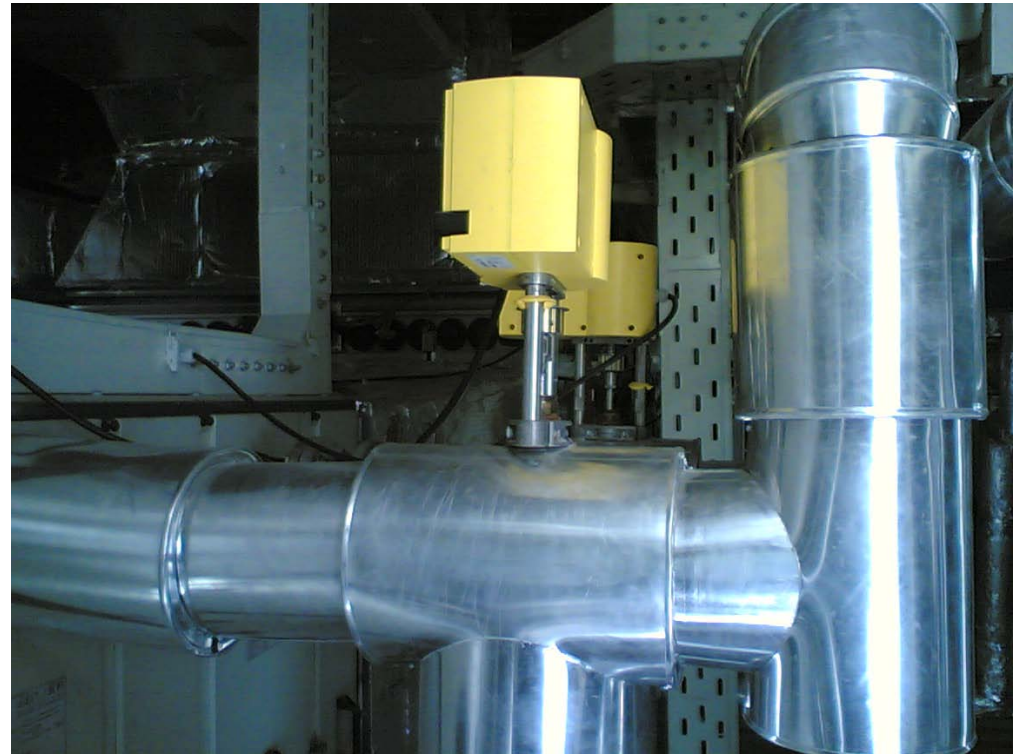
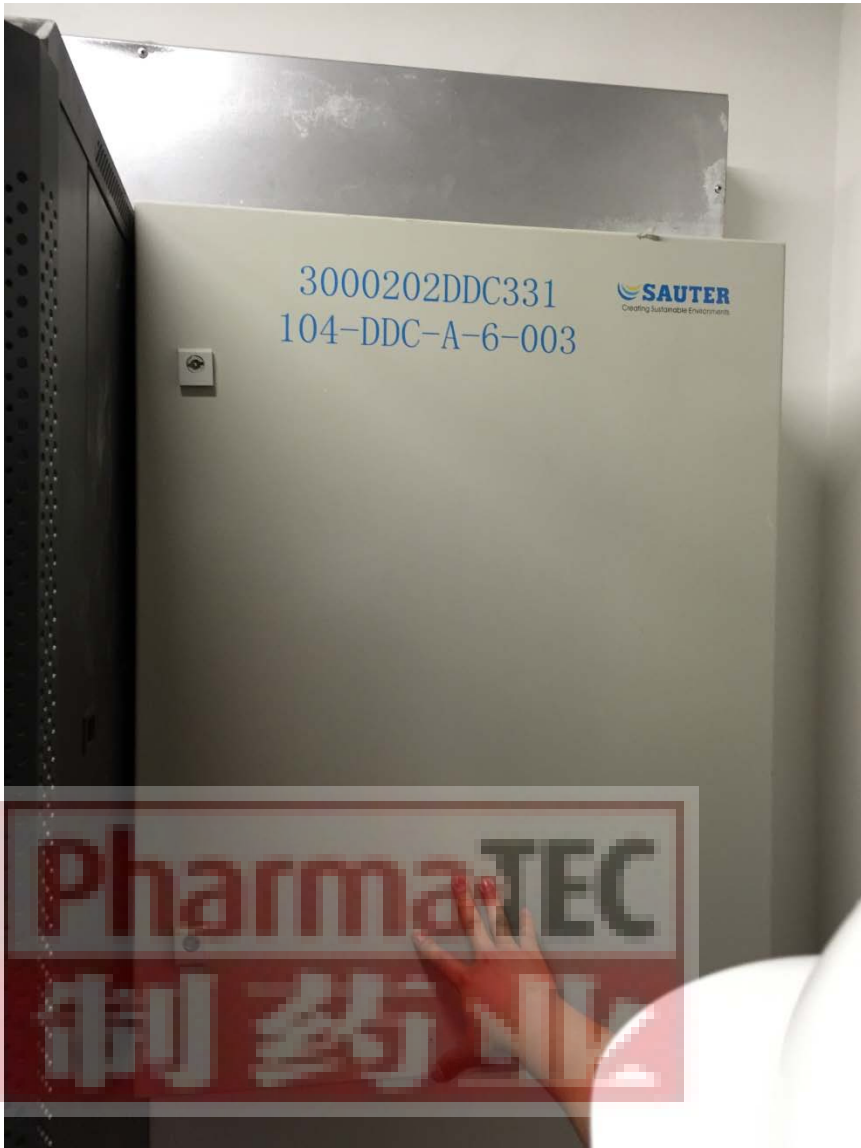


Pharmaceutical  
Water Treatment

# Site pictures



# Site pictures



# Site pictures

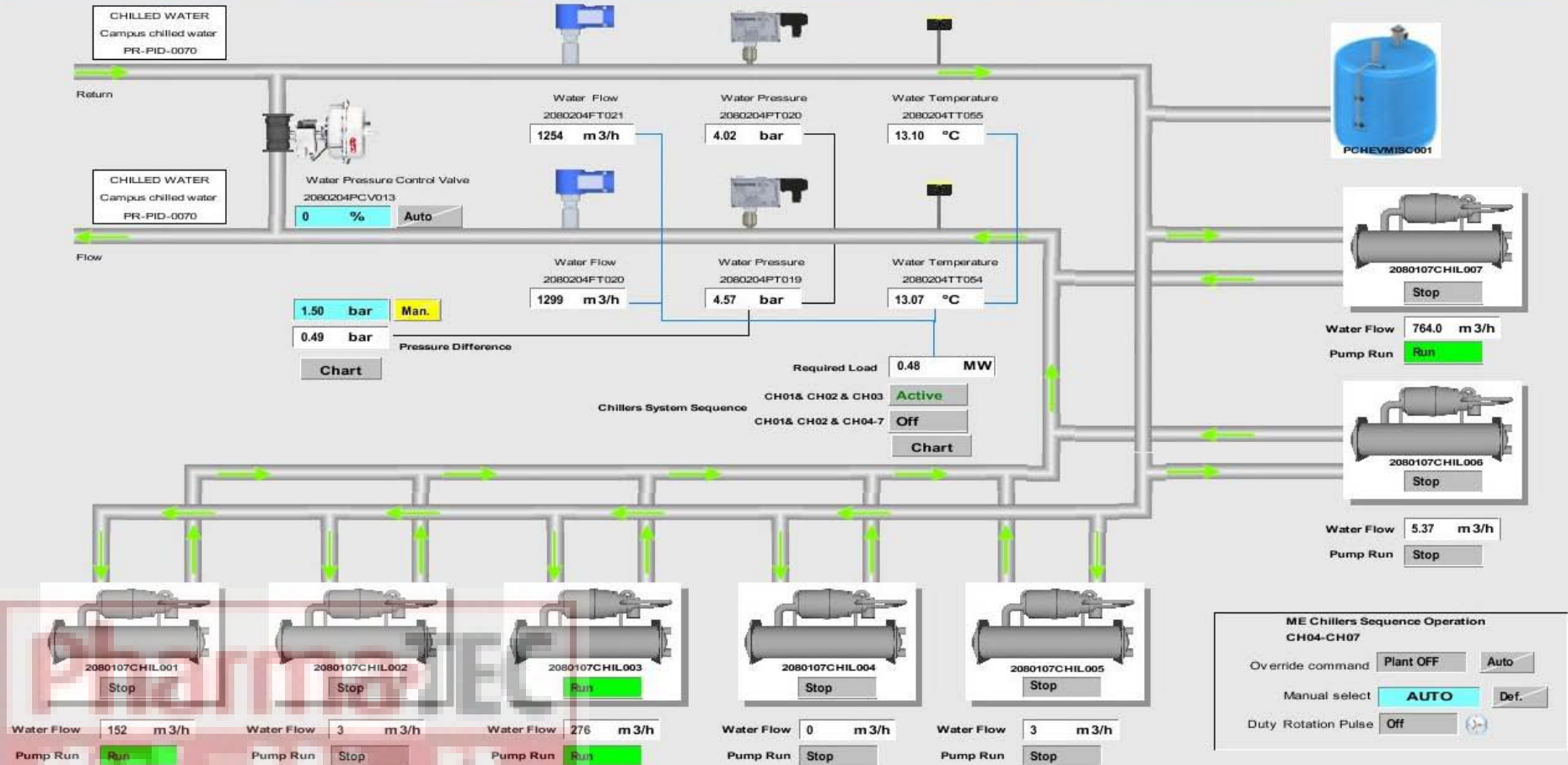


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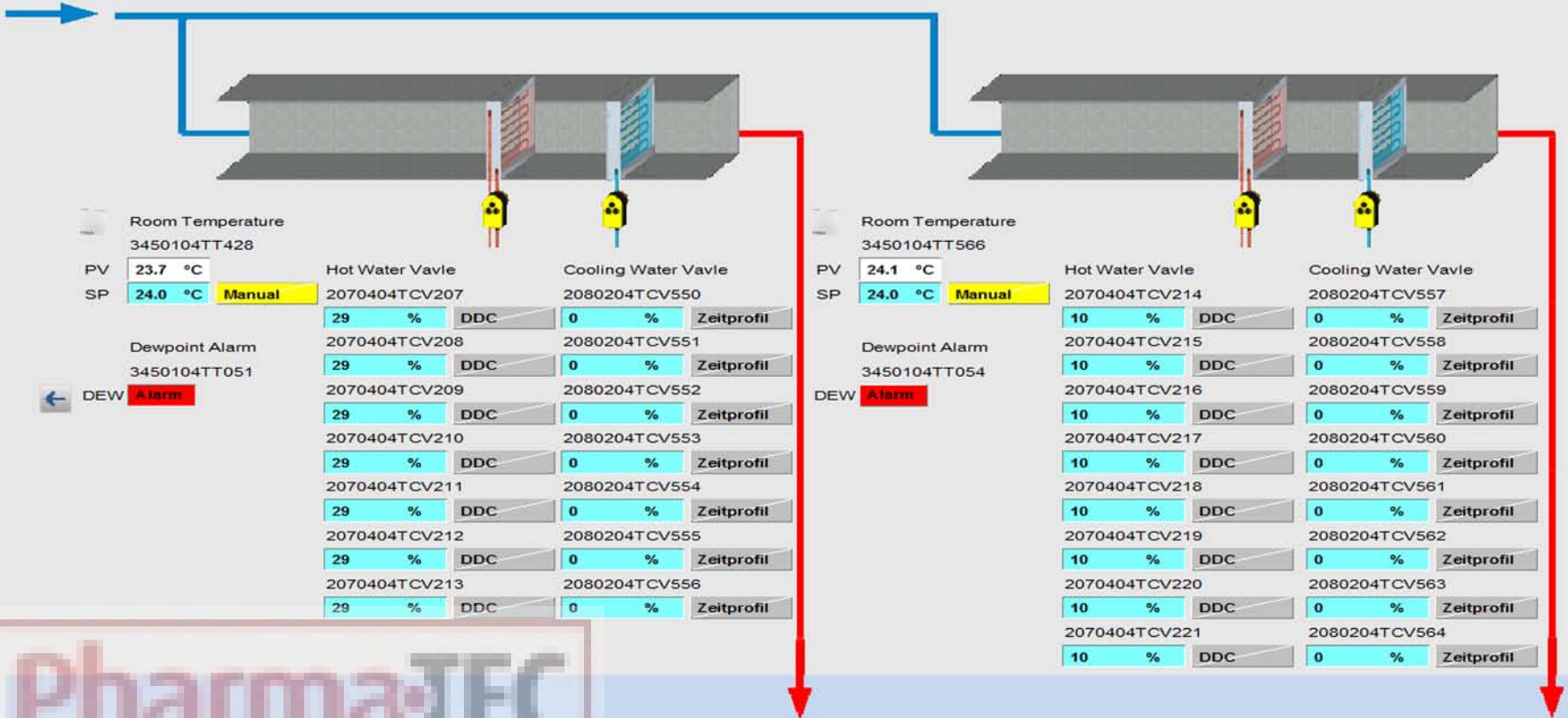
# Chilled water control

## Energy Center (191) - Utility Systems - Chilled Water System



# Active chilled beam control

NIBR Campus - C5 Lab Building - Level5 - Zone5.23 - Chilled Beam



Room Temperature  
3450104TT428

PV 23.7 °C

SP 24.0 °C Manual

Dewpoint Alarm

3450104TT051

DEW Alarm

Hot Water Vavle

2070404TCV207

29 % DDC

2070404TCV208

29 % DDC

2070404TCV209

29 % DDC

2070404TCV210

29 % DDC

2070404TCV211

29 % DDC

2070404TCV212

29 % DDC

2070404TCV213

29 % DDC

Cooling Water Vavle

2080204TCV550

0 % Zeitprofil

2080204TCV551

0 % Zeitprofil

2080204TCV552

0 % Zeitprofil

2080204TCV553

0 % Zeitprofil

2080204TCV554

0 % Zeitprofil

2080204TCV555

0 % Zeitprofil

2080204TCV556

0 % Zeitprofil

Room Temperature  
3450104TT566

PV 24.1 °C

SP 24.0 °C Manual

Dewpoint Alarm

3450104TT054

DEW Alarm

Hot Water Vavle

2070404TCV214

10 % DDC

2070404TCV215

10 % DDC

2070404TCV216

10 % DDC

2070404TCV217

10 % DDC

2070404TCV218

10 % DDC

2070404TCV219

10 % DDC

2070404TCV220

10 % DDC

2070404TCV221

10 % DDC

Cooling Water Vavle

2080204TCV557

0 % Zeitprofil

2080204TCV558

0 % Zeitprofil

2080204TCV559

0 % Zeitprofil

2080204TCV560

0 % Zeitprofil

2080204TCV561

0 % Zeitprofil

2080204TCV562

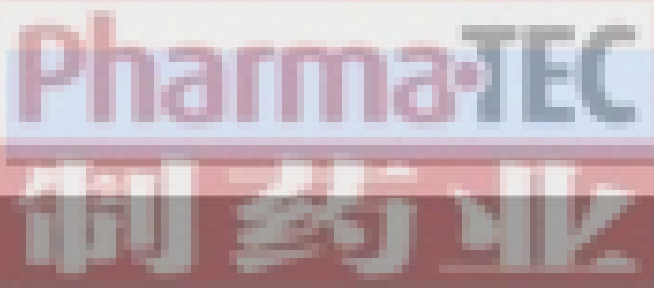
0 % Zeitprofil

2080204TCV563

0 % Zeitprofil

2080204TCV564

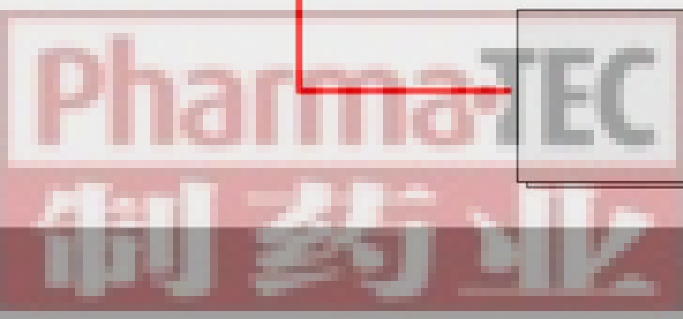
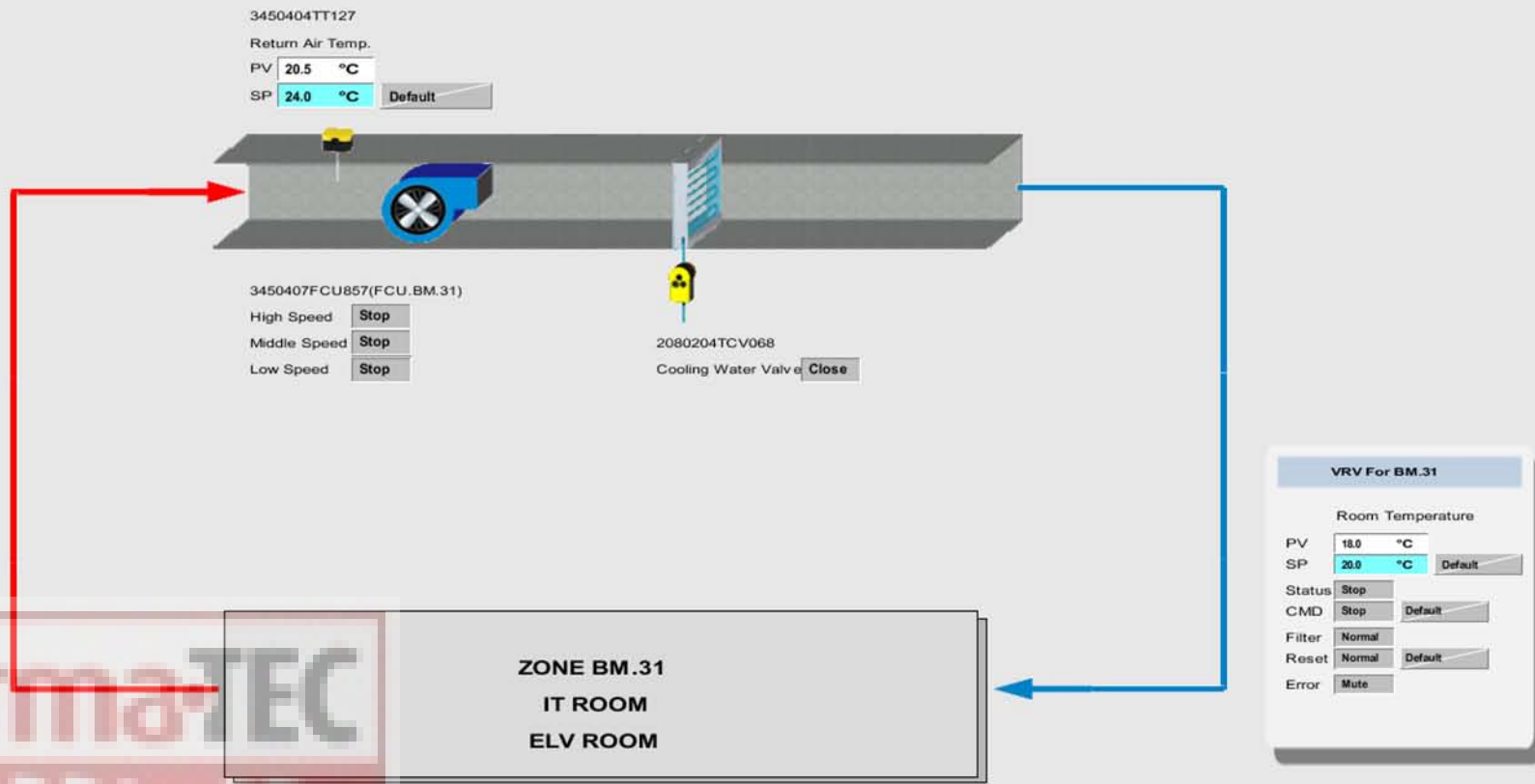
0 % Zeitprofil



Office Area

# FCU/PTU/FTU/FPB control

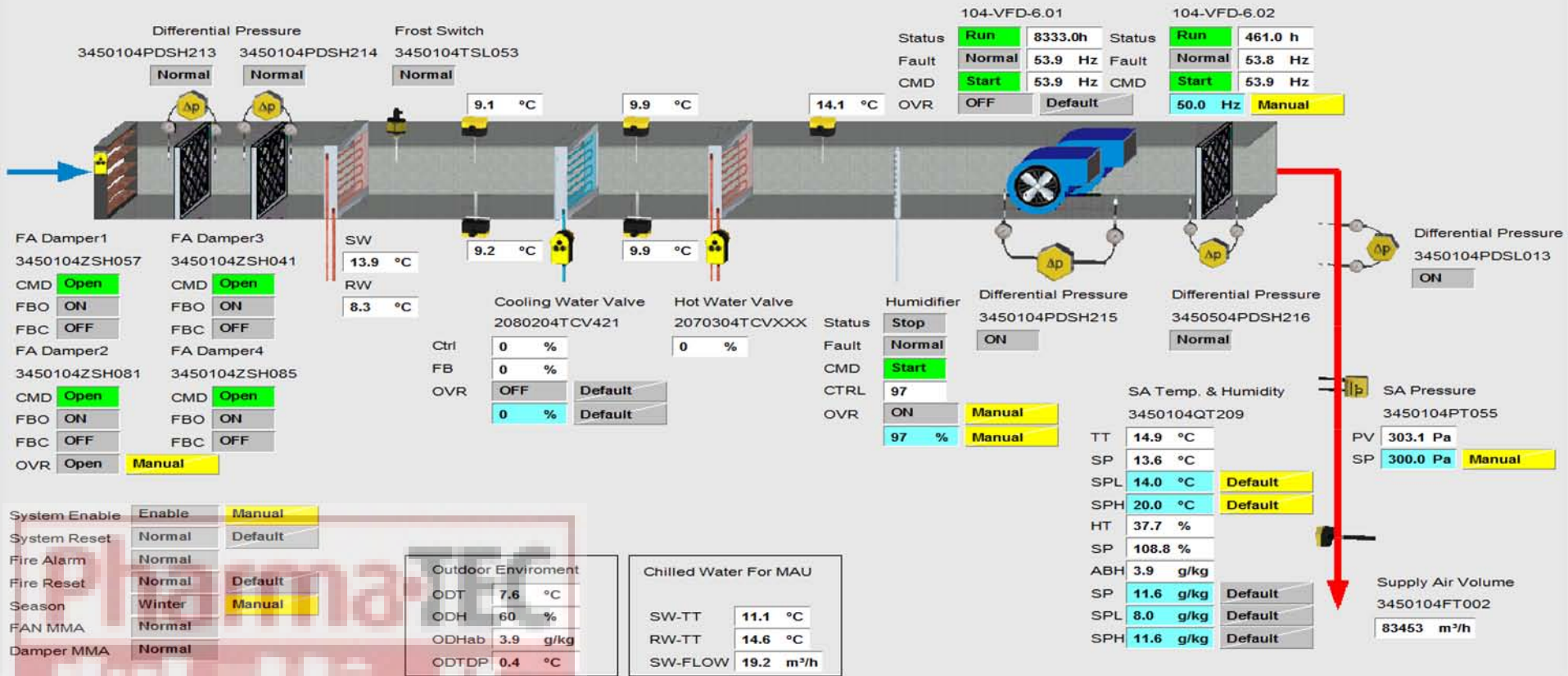
C11-2 LAB Building - HVAC System - FCU.BM.31 System



FCU.B.31 System

# Typical MAU/AHU control

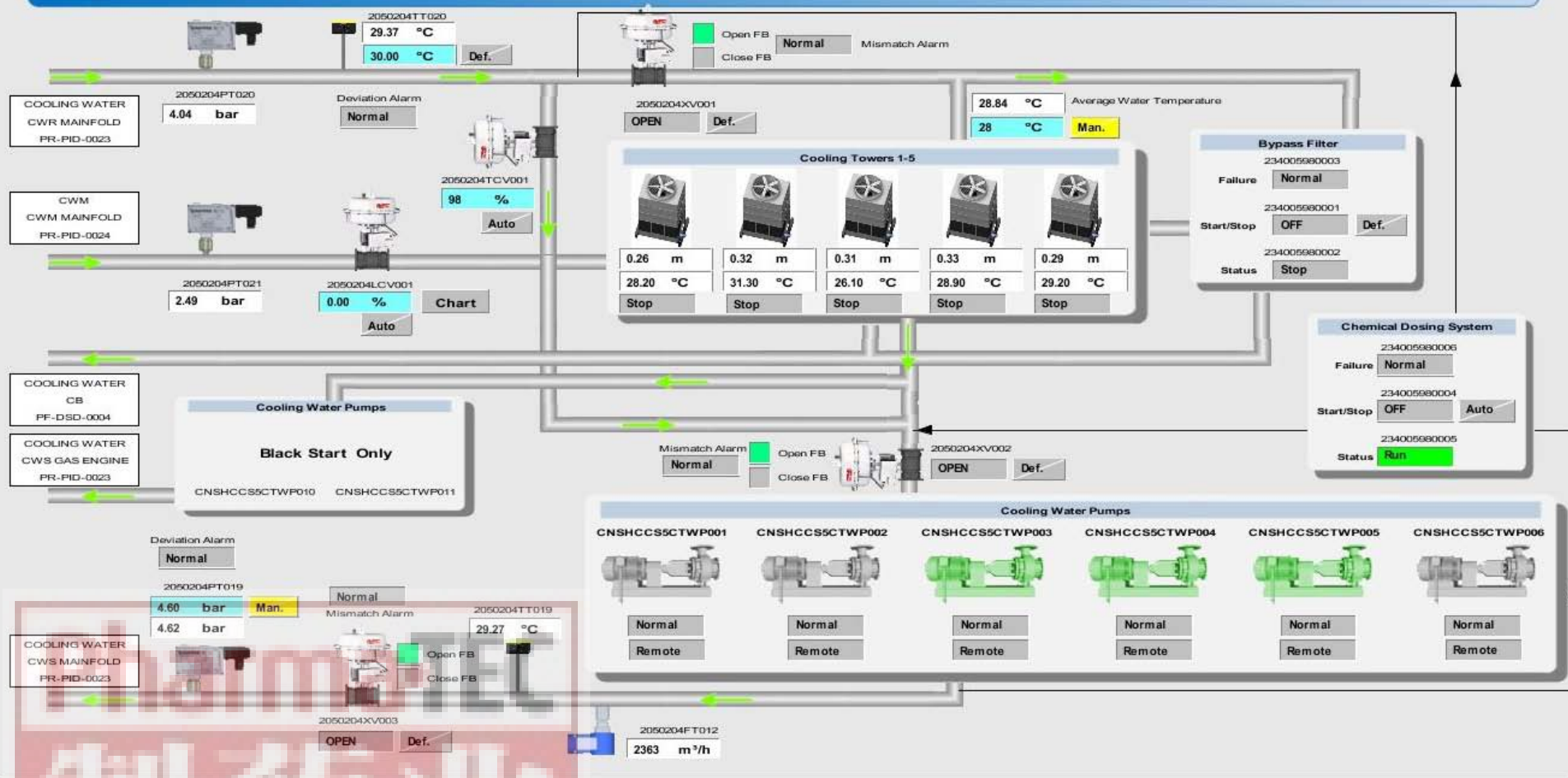
NIBR Campus - C5 Lab Building - HVAC System - MAU 6.01



Lab Building Level 1~5

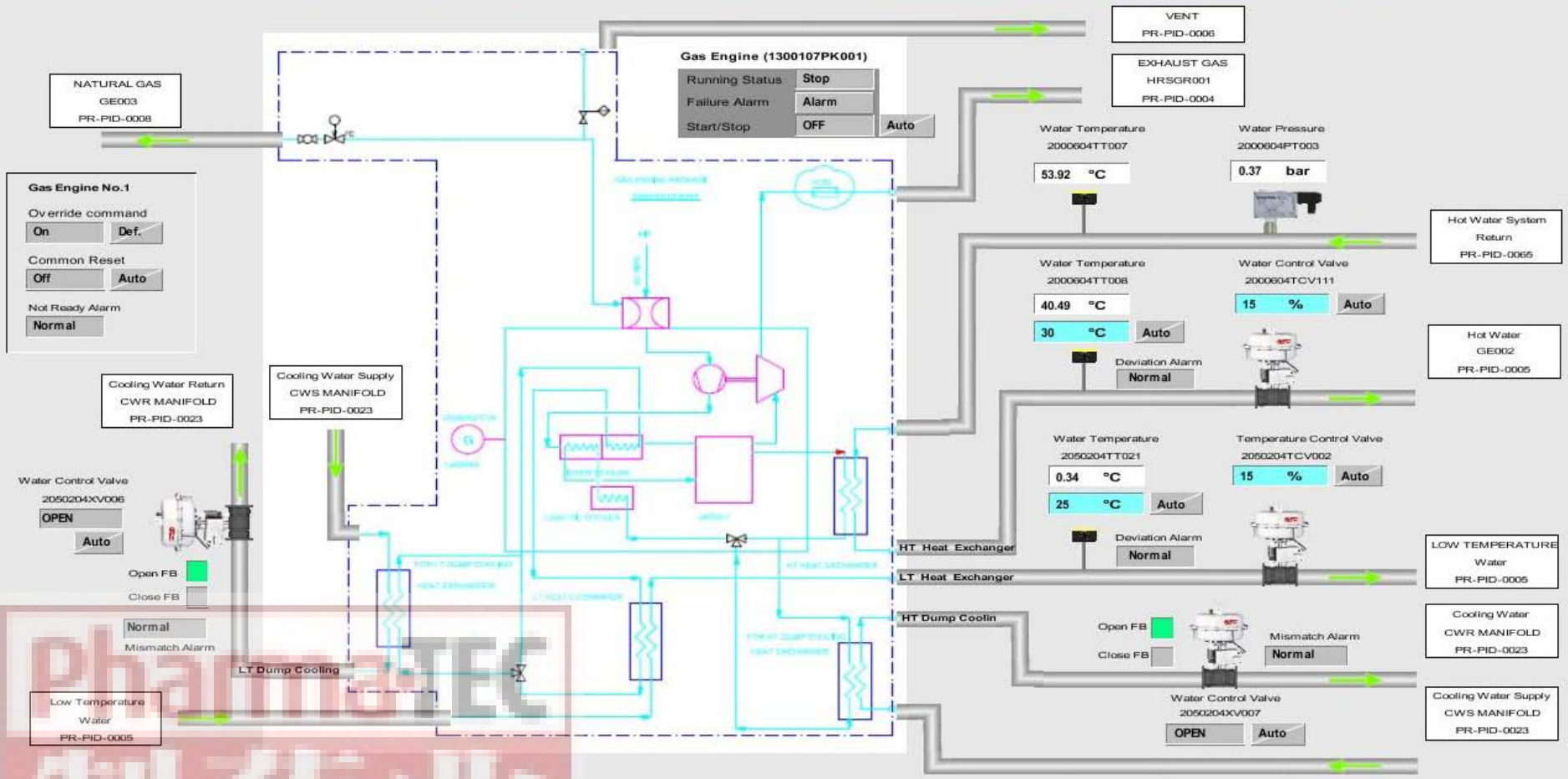
# Cooling water control

## Energy Center (191) - Utility Systems - Cooling Water System



# Tri-generation control

Energy Center (191) - Utility Systems - Gas Engine System - Gas Engine No.1 System



Gas Engine No.1 System

# Summary



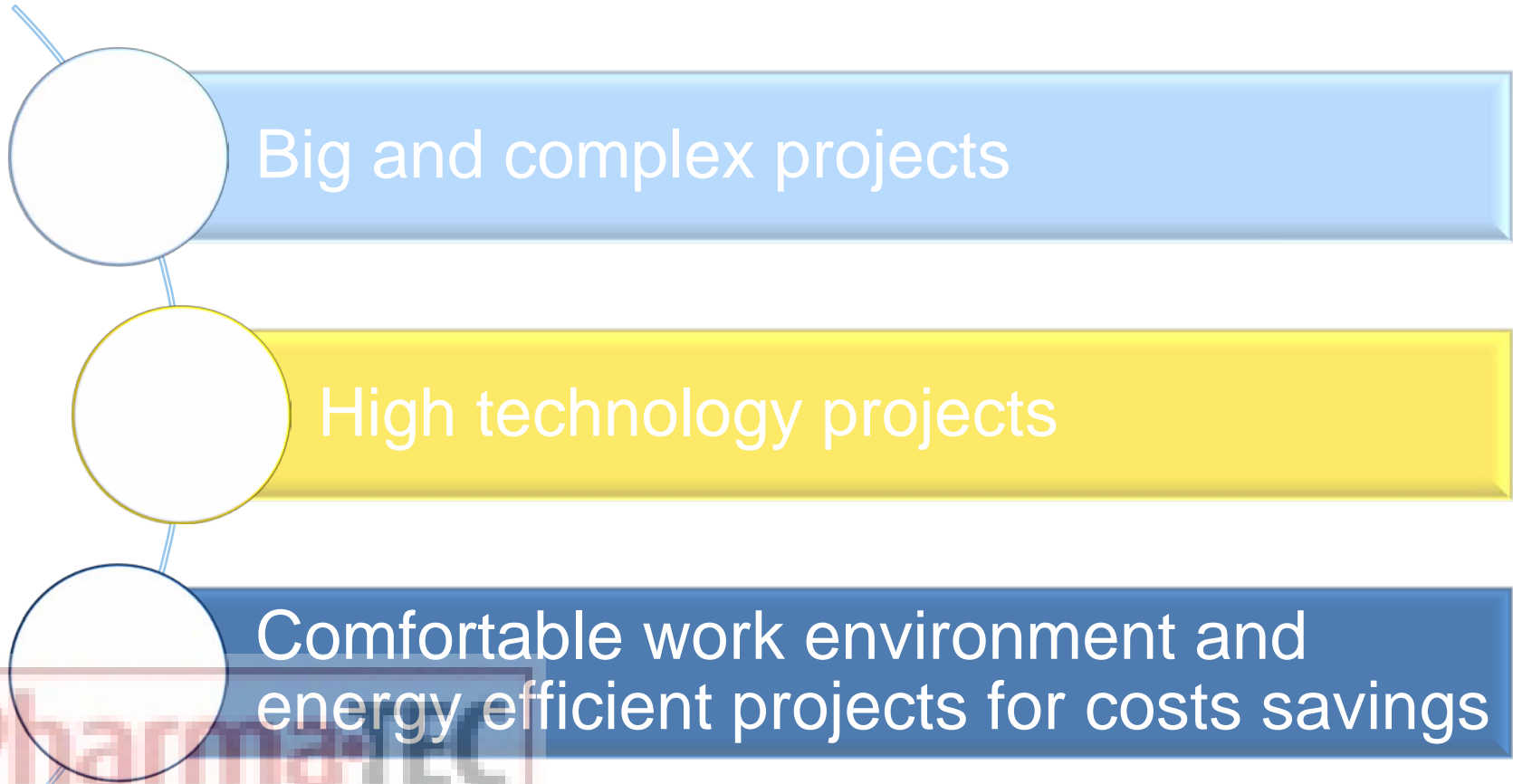
- Special application and expert knowledge gained over 100 years.
- Knowledge of all national and international standards.
- Highest product and consulting capability for qualification and validation.
- Professional project execution according to GAMP 5, GMP and FDA requirements.
- Maximum energy efficiency.

Pharma-TEC

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1910  
2010 **100**  
INNOVATION

# SAUTER is your ideal partner



Pharmaceutical  
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# Sauter in the Life Science Industry

Long experience and the Sauter overall expertise in pharmaceuticals and laboratories.



Pharmaceutical companies



Chemical companies



Research & Development centres



Medical technology companies



Colleges & universities



Hospitals

## Industrial Reference

### 实验室



### Laboratory

中国农业科学院兰州兽医研究所  
国家口蹄疫实验室

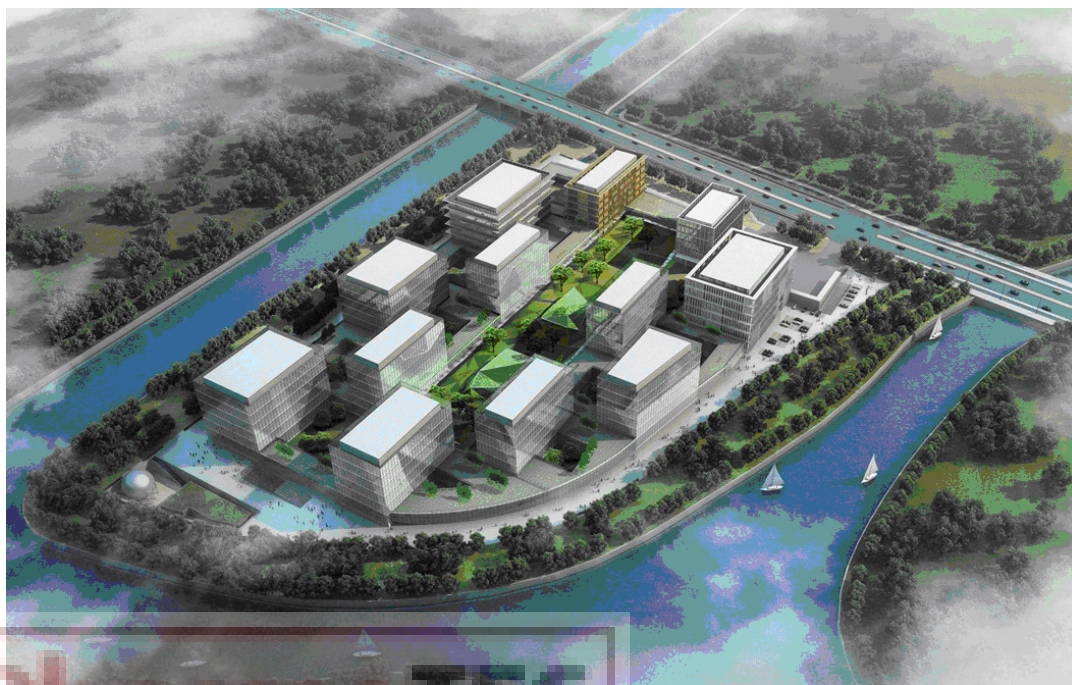
- 4,900 控制点
- 大动物房实验室
- 大动物房实验室
- 通风柜、生物安全柜控制
- 暖通空调系统控制
- 气密门、密闭阀控制
- 风冷热泵机组、冷却水、污水、高压灭菌器、低温冰箱、发电机等系统集成

中国农业科学院兰州兽医研究所  
国家口蹄疫实验室  
兰州

PH  
TEC  
制 药 业

## Industrial Reference

### 研发中心



诺华中国研究中心—全球最大的生物研发中心  
上海张江

### R&D Center

#### Novartis Institute of Bio- medical Research 诺华中国生物研发中心

- 40,000 控制点
- 生物安全实验室
- 动物房
- 通风柜
- 暖通空调系统控制
- 锅炉、冷水机组、安防、压缩空气、发电机、电力计量等系统集成

PHARMACEUTICAL  
制药行业

## Industrial Reference

实验室



Laboratory

Friedrich Loeffler Institutes

Owner: Federal Ministry of Food,  
Agriculture and Consumer  
Protection, Germany

■ Pneumatic control for animal  
lab

弗利德里希·勒福乐动物传染病研究所  
德国  
全球最大的P4实验室

Pharmatec  
制药业

## Industrial Reference

### R&D Center

#### **Novo Nordisk China R&D Center** 诺和诺德中国研发中心

- 6,100控制点
- 暖通空调系统
- 啮齿动物、狗房等实验室80间
- 通风柜33台
- 冷水机组、锅炉等系统集成



诺和诺德中国研发中心  
北京昌平

Pharma·TEC  
制 药 业

## Industrial Reference



美国药典中华区总部  
上海外高桥

Pharma·TEC  
制 药 业

### R&D Center

#### US Pharmacopeial Greater China R&D Center 美国药典中华区总部

- 2,200控制点
- 暖通空调系统
- 实验室80间
- 通风柜20台(双门)
- 压力无关型蝶阀185套
- 冷水机组群控
- 冷水机组、除湿机、精密空调等系统集成

## Industrial Reference

研发中心

R&D Center



### Procter & Gamble China Technical Centre

Owner: P & G

- 8,000 control points
- Office area BMS control
- Lab pressure control
- Fumehood control

宝洁中国技术中心  
北京

Pharmia·TEC  
制 药 业

## Industrial Reference

### 美孚亚太区研发中心

### Exxon Mobil Asia Pacific R&D Centre

该项目包括公用站房、实验室以及办公区的控制。办公区214VAV, 实验室3个, 21台通风柜。

- 6,000 control points
- AHU
- VAV & pressure control for 3 labs
- VAV control for office area
- 21 sets of fume hood control
- Domestic water & drainage system
- Electrical metering integration
- Compressed air integration
- Chiller & Boiler integration
- Lighting control
- IT room leakage detection

### R&D Center



埃克森美孚石油亚太研发中心  
上海



# Industrial Reference

制药厂



Pharmaceutical  
Factory

## Boehringer Ingelheim Panda Project

Owner: Boehringer Ingelheim Pharmaceuticals Ltd.

- 3,800 control points
- HVAC
- System Integration
- Energy Management System
- Environmental Monitoring System
- Qualification and Validation

勃林格殷格翰上海Panda项目  
上海张江

Pharmaceutical  
制药业

## Industrial Reference

### Pharmaceutical Factory

#### BI Biolab Shanghai BI 上海熊Biolab项目

Owner: Boehringer Ingelheim  
Pharmaceuticals Ltd

- BMS Control point: 430
- HVAC
- Room pressure and VAV control
- System Integration
- Environmental Monitoring System(60 points)
- Qualification and Validation



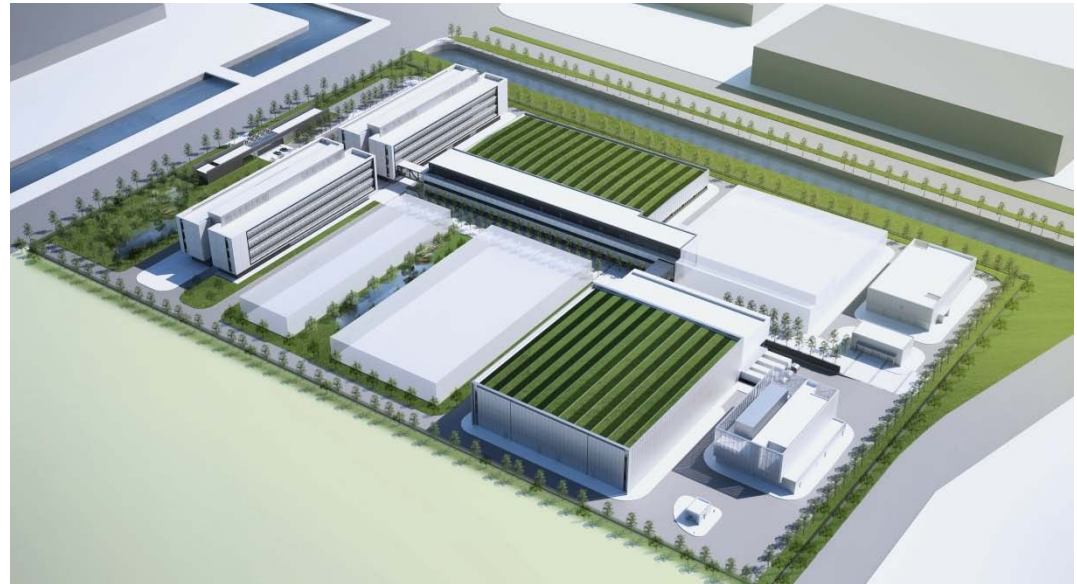
BI Biolab项目  
上海

## Industrial Reference

### Pharmaceutical Factory

苏州罗氏诊断IVD Greenfield项目  
Roche Suzhou IVD Greenfield

- 9,000 control points
- HVAC
- Intelligent Lighting
- Leakage detection
- Gas detection
- Room pressure
- Fumehood control
- Environmental monitoring system
- Energy management system
- Virtual Machine



苏州罗氏诊断IVD Greenfield厂房  
江苏苏州

# Industrial Reference

制药厂



## Pharmaceutical Factory

苏州罗氏诊断Early Package项目  
Roche Suzhou EP Project

Owner: Roche Diagnostics  
Ltd.

- 1,000 control points
- HVAC
- Room pressure
- Fumehood control
- Environmental monitoring system
- Virtual Machine

苏州罗氏诊断EP项目  
江苏苏州

PharmoTEC  
制药业

## Industrial Reference

制药厂



罗氏制药SHIP厂房  
上海

Pharmaceutical  
Factory

### Roche Shanghai High Potent Production

Owner: Shanghai Roche  
Pharmaceuticals Ltd

- 2,000 sqm
- 1,000 control points
- HVAC, Steam Generation, Purified Water system, Compressed Air system,
- Monitoring System is fully validated compliance with FDA CFR 21 Part 11

## Industrial Reference

### Pharmaceutical Factory

#### Roche Shanghai RoSE I project

- 20,000 sqm
- 10,000 control points
- HVAC, Lab, Fumehood, FCU, Ground Heating pump, Steam System.
- Monitoring System
- Validation and Qualification



罗氏 RoSE I 厂房, 上海

Pharma·TEC  
制 药 业

## Industrial Reference

制药厂



罗氏 RoSE II 厂房, 上海

PharmaTEC  
制药业

Pharmaceutical  
Factory

**Roche Shanghai  
RoSE II project**

Owner: Shanghai Roche  
Pharmaceuticals Ltd

- 6,000 sqm
- 3,000 control points
- HVAC
- Room Control
- Chilled Beam system

## Industrial Reference

### Pharmaceutical Factory

#### Roche Shanghai iCUP project

- 4,000 sqm
- 1,200 control points
- HVAC
- Steam System
- Chiller
- Boiler
- Chilled water sequence control
- Explosive-proof area control



罗氏 iCUP项目, 上海

PharmaTEC  
制 药 业



## Industrial Reference

### Pharmaceutical Factory

#### 诺维信(中国)生物医药天津厂 Novozymes (China) Bio-Pharma CGP Plant (P1)

- 1,000 control points
- AHU
- VAV & pressure control
- FDA qualification and validation

NOVOZYMES (CHINA) BIOPHARMA COMPANY LIMITED BHA CGMP PROJECT  
诺维信(中国)生物医药有限公司透明质酸原料药生产项目



NNE PHARMAPLAN (TIANJIN) COMPANY LIMITED  
恩宜站玛(天津)工程有限公司

CENTRAL RESEARCH INSTITUTE OF CHINA CHEMICAL SCIENCE AND TECHNOLOGY  
中化化工科学技术研究院

#### 诺维信(中国)生物医药天津厂 天津

Pharma·TEC  
制 药 业

# Industrial Reference

制药厂



诺华制药生产厂房  
江苏常熟

Pharmaceutical  
Factory

## Novartis Pharma Plant In Jiangsu Changshu

Owner: Changshu Novartis  
Pharmaceuticals Ltd

- 20,000 sqm
- HVAC
- Electronic and Pneumatic control for lab temperature, humidity and pressure
- Fume Hood Control System

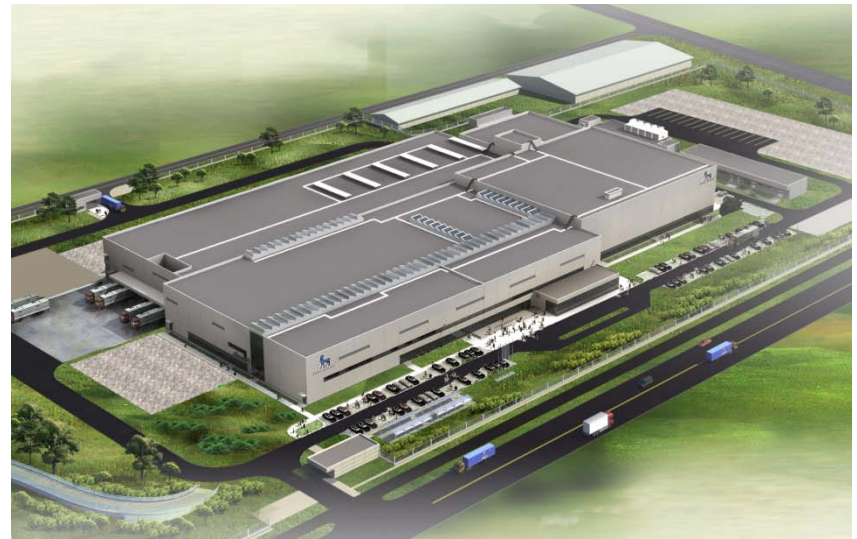
Pharmaceutical  
制药业

## Industrial Reference

### Pharmaceutical Factory

诺和诺德中国制药厂房(天津)  
**Tianjin Novo Nordisk  
Pharmaceutical Company**

- 2,000 sqm
- 500 control points
- Lab
- Fumehood
- BACnet system



诺和诺德中国制药厂房  
天津

Pharma·TEC  
制 药 业

## Industrial Reference

制药厂



Pharmaceutical  
Factory

### Novartis Pharma Plant In Beijing

Owner: Beijing Novartis  
Pharmaceuticals Ltd

- 10,000 sqm
- Electronic and Pneumatic control for temperature, humidity and pressure
- Building automation system & Monitoring System are fully qualified

诺华制药生产厂房  
北京

Pharmaceutical  
制药业

## Industrial Reference



### Sanofi Merial Animal Healthcare Centre

Owner: Merial China (a branch company of Sanofi)

- 15,000 sqm
- 3,000 control points
- HVAC
- Lab control
- Validation

Pharmaceutical  
赛诺菲-梅里亚南昌动物保健  
江西南昌

制药业



Creating Sustainable Environments.

Thank you !

Pharma·TEC

制 药 业

