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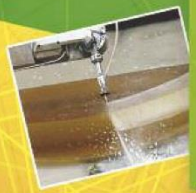

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About us

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Today, ERM has become a market leader in didactic solutions and systems for technological and vocational training in France, and is developing its export markets.

More than 1500 academic institutions are equipped with ERM technical teaching equipment in France: Secondary schools for vocational training, Vocational training centers, Universities, Universities of Technology, Major engineering schools, etc.

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- French overseas territories: Guadeloupe, Guyana, Reunion, Martinique, Mayotte, New Caledonia, French Polynesia, Wallis & Futuna
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Thermal engineering & Renewable energy

Instruments, tools and data acquisition : See pages I4 to I7

Air/Water heat pump - Instrumented 6kW reversible heat pump

Positive / Negative cold rooms

Commercial/Industrial refrigeration unit – Multi-compressor system supplying several refrigeration units

CTA Flex - Air handling system

Solar water heater: Basic Solerm - Instrumented domestic solar water heater

Gas boiler and fuel oil burner simulators

Air/Water heat pump - Instrumented 6kW reversible heat pump

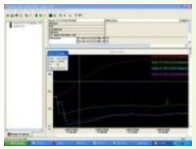
➢ *Features*
- **Thermodynamic** equipment
- Thermal control
- Fluid system (circulation unit, expansion tank, buffer tank…)
- Measurements (thermal and electrical meters, temperature, HP and LP manometer)

➢ *Training activities:*
- **Hydraulic and electrical** wiring and connecting
- **Commissioning, configuration** and **maintenance**
- **Overall and subsystem thermal balance**
- Techno-economic and environmental analyses
- Dimensioning the installation

➢ *Key points:*
- Real heat pump
- Software for datalogging (with option PC21 or PC22)

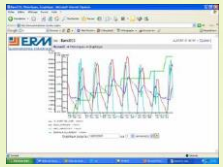
➢ *References:* **PC60:** Instrumented 6kW Air/Water heat pump (with hydraulic unit) – **PC61:** 3-way valve for Domestic Hot Water production (tank with exchanger not included) – **PC21:** Data logging and teleprocessing station – **PC22:** 4-channel temperature recorder and data logger with 8 thermocouple probes – **PC23:** Tube-in-shell exchanger (Optional) – **PC25:** 15kW hot water air heater

Temperature recorder and data logger (PC22)



→ With 8 thermocouple probes and acquisition software

Data logging & teleprocessing (PC21)



Air/Water heat pump with inverter & fan coil unit – Studying a reversible air/water heat pump with a high performance fan coil unit

→ Studying a real Air/Water heat pump with inverter and fan coil unit

→ Thermal and electrical measurements (voltage, current, 12 temperatures, refrigeration and hydraulic pressure, water and air flow, electronic control signals)

→ User-friendly data acquisition with Labview

→ Configuration and control (water logic…)

→ References: **PC40-PC42:** Air/water heat pump & fan coil unit (with HP/BP manometers and power consumption analyzer) – **GD12:** KNX home automated controller and supervision – **MO21:** Data logger and monitoring via Ethernet – **AQ10**: USB data logger – **AQ11:** Differential voltage probe for USB data logger – **AQ12:** AC current clamp for USB data logger

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Water/Water heat pump - Instrumented 5kW reversible heat pump

New

➢ *Features*
- **Thermodynamic** equipment
- Thermal control
- Plate heat exchanger
- Fluid system (circulation unit, expansion tank, buffer tank…)
- Measurements (thermal and electrical meters, temperature, HP and LP manometer)

➢ *Training activities:*
- **Hydraulic and electrical** wiring and connecting
- **Commissioning, configuration** and **maintenance**
- **Overall and subsystem thermal balance**
- Techno-economic and environmental analyses
- Dimensioning the installation

➢ *Key points:*
- Real heat pump
- 50L buffer tank to avoid short-cycle
- Software for datalogging (with option PC21 or PC22)

➢ *References:* **PC55:** Instrumented 5kW Water/Water heat pump with external exchanger – **PC51:** 3-way valve for Domestic Hot Water production (tank with exchanger not included) – **PC52:** Drilling pump and 1000L tank – **PC21:** Data logging and teleprocessing station – **PC22:** 4-channel temperature recorder and data logger with thermocouple probes – **PC23:** Tube-in-shell exchanger (Optional) – **PC25:** 15kW hot water air heater

Water chiller – Study and implementation of a reversible inverter water chiller

➢ *Features:*
- **Thermodynamic residential** equipment
- Thermal control
- Fluid system (circulation, expansion tank, buffer tank…)
- Measurements (thermal and electrical meters, temperature, HP and LP manometer)

➢ *Training activities:*
- **Hydraulic and electrical** wiring and connecting
- **Commissioning, configuration** and **maintenance**

- **Dimensioning** the installation, Overall and subsystem **thermal balance**
- Techno-economic and environmental analyses
- **Benefits of an inverter** (speed drive on the compressor)
- Study of the **thermodynamic cycle**

➢ *Key points:*
- Essential equipment for a training center, to be connected to distribution benches, heat emission benches, air handling systems…
- 25L buffer tank 25L, integrated to avoid short-cycle

➢ *References:* **PC30:** Air/Water reversible inverter 10kW chiller – **PC31:** Faulty components for diagnostic activities – **PC32:** Air/Water reversible inverter 6kW chiller – **PC33:** Air/Water reversible inverter 15kW chiller

Heating & Hot Water

Wood-pellet heater - Instrumented 10kW automatic heater

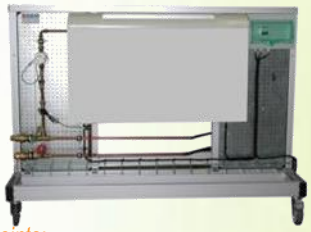
➢ *Features*
- Combustion appliances
- Thermal insulation materials (**instrumented chimney**)
- Pellet storage (300kg Silo)
- **Thermal control**
- Fluid system (circulation unit, expansion tank, buffer tank…)
- Measurements (energy meter, temperature, manometer)

➢ *Training activities:*
- **Hydraulic and electrical** wiring and connecting
- **Commissioning, configuration** and maintenance
- **Overall and subsystem thermal balance**
- Detection of pressure losses and chimney draught**...**
- Techno-economic and environmental analyses
- **Dimensioning the installation**

➢ *Key points:*
- Installation within the workshops by a professional team

➢ *References:* **GB20:** 10kW Wood-pellet heater – **GB30:** 24kW Wood-pellets and plates heater with mini-silo, 700L buffer tank – **PC21:** Data logging and teleprocessing station – **PC22:** 4-channel temperature recorder and data logger with 8 thermocouple probes

Fan coil bench - Bench for studying, connecting and operating fan coils



➢ *Features*
- Heat emission (**2 fan coils on frame**)
- Measurements (flow, energy, temperature)

➢ *Training activities:*
- **Operation, configuration** and **maintenance**
- Connection to a heat generator

➢ *Key points:*
- Bench for studying the problems related to heating and refrigerating by blowing air
- **Quick connection** to ERM heat generation platforms

➢ *References:* **VC10:** Fan coil bench – **VC11:** Energy meters (Optional) – **VC12:** Balancing valves (Optional) – **ME10:** Balancing tool

Heater unit – Hot water air heater

➢ *Features:*
- Heat emission (hot water air heater)
- Measurements (flow, energy, temperature)

➢ *Training activities:*
- Commissioning, configuration and maintenance
- Connection to a heat generator

➢ *Key points:*
- Bench for studying the problems related to heating and refrigerating by supply air
- **Quick connection** to ERM heat generation platforms.

➢ *References*: **PC25:** 15kW Heater unit – **PC26:** 15kW Heater unit with rack

Radiator balancing bench - Bench for balancing and commissioning radiator columns

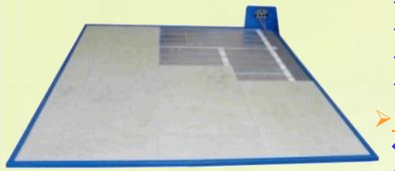
➢ *Features:*
- Heat emission (6 radiators on frame)
- Thermal control (thermostatic taps)
- Balancing (balancing valves)
- Measurements (flow, energy, temperature)

➢ *Training activities:*
- Studying pressure losses with the multi-turn valves
- Balancing of heating systems
- Commissioning, configuration and maintenance
- Connection to a heat generator

➢ *Key points:*
- Bench for studying problems related to collective heating systems
- **Quick connection** to ERM heat generation platforms.

➢ *References:* **RA10:** Balancing bench with low-temperature radiators – **RA11:** Energy meters (Optional) – **RA12:** Balancing valves (Optional) – **ME10:** Balancing tool

Floor heating bench – Assembly kit for floor heating systems



➢ *Features:*
- Heat emission (10m ² floor heating mat)
- Thermal control (3-way valve and aquastat)
- Balancing (balancing valves)
- Measurements (flow, energy, temperature)

➢ *Training activities:*
- Assembly of floor heating systems and connection to a heat generator
- Commissioning, adjustments and maintenance
- Measuring temperature changes and interpretation
- Analysis of system performance in heating and cooling modes

➢ *Key points:*
- Study and use of floor heating technology
- Bench may be assembled and disassembled for training activities

➢ *References:* **PV20:** Floor heating bench – **PV21:** Connection for floor heating (circulator, 3-way valve, regulator) – **PV11:** Thermal measurements (Optional)

Water exchanger – Water air heater

➢ *Features:*
- Heat exchanger (plate heat exchanger)
- Measurements (flow, energy, temperature)

➢ *Training activities:*
- Study of exchangers (performance, flow impact…)
- Flow adjustment to optimize performance

➢ *Key point:*
- **Quick connection** to the other ERM benches

➢ *Reference:* **PC27:** Water exchanger

Primary/Secondary hydraulic distribution bench – Primary/secondary hydraulic distribution with buffer tank, hydraulic separator and 4-circuit collector

➢ *Features:*
- Buffer tank and hydraulic separator
- Low-energy circulator
- Motorized 3-way mixing valve
- Thermal measurement (temperature, flow)

➢ *Training activities:*
- Study of **heating network balancing**
- Adjustment of the low-energy circulator
- Connecting to a heat generator (primary) and to emitters (secondary)

➢ *Key points:*
- **Time-saving technology for connection** to the other benches of the Climaflex thermal platform
- **The bench can also be used with any type of heat generator that is already in the workshop**

➢ *References:* **HP10:** Primary/secondary hydraulic distribution bench with buffer tank, hydraulic separator and 4-circuit collector (without circulator) – **HS11:** Variable-flow circulator module for direct secondary distribution to emitters, with thermometers, flowmeter and TA balancing valve - **HS12:** Variable-flow circulator module and motorized 3-way mixing valve for secondary distribution to emitters, with thermometers, flowmeter, 3-way valve controller and TA balancing valve

Solar water heater: CESI Solerm - Instrumented and communication-capable domestic solar water heater

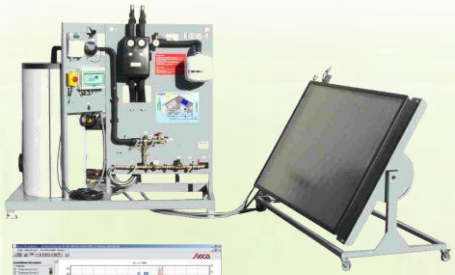
➢ *Features:*
- Heat production (4m² **flat plate collectors**)
- **Thermal storage** (300L tank simple or double heat exchanger with immersion heating resistance)
- Thermal control (**differential control**)
- Fluid system (circulation group, expansion tank…)
- Measurements (energy meter, insolation, temperature, manometer)
- Communication and supervision (**communication-capable data logger**)

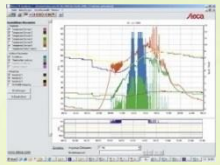
➢ *Training activities:*
- **Hydraulic and electrical** wiring and connection
- Overall and subsystem **thermal balance**
- Supervision adjustments and control
- **Preventive maintenance** of the installation
- Techno-economic and environmental analyses
- Eco-design of thermal solar collectors
- **Dimensioning** the installation...

➢ *Key points*
- Simulation of standard water consumption using a programmed solenoid valve

➢ *References:* **AB70:** Solar water heater CESI Solerm: basic equipment (frame, pipes and fittings, electrical cabinet, sensors, data logging and supervision) – **AB71:** Solar water heater kit (300L tank, 2 sensors) for inclined roof – **AB72**: Solar water heater Kit (300L tank, 2 sensors) for flat roof – **AB73:** Solar water heater Kit (300L tank, 2 sensors) for sun-breaker installation – **so//PRKO**: Maintenance tool case – **AB36**: Filling station

Solar water heater: Basic Solerm - Instrumented domestic solar water heater





➢ *Features:*
- Heat production (2.5m² **flat plate collectors**)
- **Thermal storage** (200L tank, double-exchanger with immersion heater)
- Thermal control (**differential controller and data logging software**)
- Fluid system (circulation group, expansion tank…)
- Measurements (energy meters, temperature, manometer)

➢ *Training activities:*
- **Hydraulic and electrical** wiring and connecting
- Overall and subsystem **thermal balance**
- **Preventive maintenance** of the installation
- Techno-economic and environmental analyses
- Eco-design of thermal solar collectors
- **Dimensioning** the installation...

Tilt adjustment of the collector

➢ *Key points :*
- **Easy data logging for a small budget**
- **Mobile solar collector** can be placed outdoors during tutorial work

➢ *References:* **AB35:** Solar water heater: Basic Solerm – **so//PRKO:** Maintenance tool case – **AB36:** Filling station

Filling station (AB36)

Maintenance tool case (so//PRKO)

→Refractometer
→Clinometer and compass
→pH measurement
→Manometer for monitoring the pressure of the expansion tank
→Voltage tester

Thermodynamic water heater - Thermodynamic instrumented water heater (DHW production by Air/Water heat pump)

➢ *Features:*
- Thermodynamic equipment (Air/Water heat pump)
- DHW Domestic Hot Water storage (300L tank, anode, safety group…)
- Measurements (thermal and electric energy meters, temperature, HP and LP manometers)

➢ *Training activities:*
- **Hydraulic and electrical** wiring and connecting
- **Study of refrigerating and electric circuits**
- Operation, adjustments and control
- **Preventive maintenance** of the installation
- Energy balance and coefficient of performance

➢ *Key points:*
- Studying a new residential application of a heat pump

➢ *References:* **TH10:** Thermodynamic water heater – **TH11:** Data logger for thermodynamic water heater - **PC22:** 4-channel temperature recorder and data logger

Boiler Simulators

SimMurale – Wall-mounted gas boiler simulator with electronic control board

➢ *Technical specifications of the simulator:*
- **Modulating residential gas boiler producing Domestic Hot Water**
- **Mimic board for viewing** the operating cycle and for **identifying** the components in a diagram
- **Boiler electronic control unit** with **electrical/electronic measuring points**
- Switch console that **generates failures**
- **Compressor-controller** unit for **gas supply simulation**

➢ *Training activities:*
- Study of the boiler and understanding the manufacturer's electric diagrams
- **Electrical connecting and measurements**
- **Configuration of the electronic control unit**
- **Gas adjustments** (valve, pressure controller, pressure switches) with **pressure and flow control** (gas supply simulation)
- Observing the **operating cycle** and **analyzing parameters**
- **Failure diagnostics** and troubleshooting procedure

➢ *Key points:*
- **Water flow and temperature simulation** (for boilers producing instantaneous DHW) on a mimic board that displays the **operating conditions** and a representation of the boiler
- Completely safe due to **fuel-free operation**, as gas is replaced by compressed air
- The system works without water, exchanger or flue: **low installation and maintenance costs**

➢ *Reference:* **SF40:** SimMurale, wall-mounted gas boiler simulator

SimFuel50 – 50kW single stage fuel oil burner simulator

➢ *Technical specifications of the simulator:*
- **50kW single stage fuel oil burner**
- **Burner control unit** with measuring and test points
- Boiler control panel with switch, thermostat and connection points
- Switch console that **generates failures**
- Boiler-simulating unit with a **10L tank of fluid oil** (replacing the fuel oil)

➢ *Training activities:*
- Study of the boiler and understanding the manufacturer's electric diagrams
- **Electrical connecting of the burner and measurement**
- **Mechanical and burner adjustments** with **pressure and flow control**
- Observing the **operating cycle** and **analyzing parameters**
- **Failure diagnostics** and troubleshooting procedure

➢ *Key points:*
- Completely safe due to **fuel-free operation**, as fuel oil is replaced by fluid oil
- The system works without water, exchanger or flue: **low installation and maintenance costs**

➢ *Reference:* **SF10:** SimFuel50, 50kW single stage fuel oil burner simulator

SimGaz50 – 50kW single stage gas burner simulator

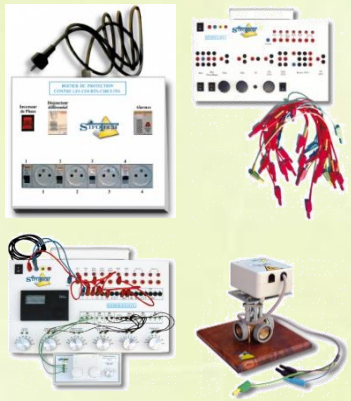
➢ *Technical specifications of the simulator:*
- **50kW single stage gas burner**
- **Gas flowmeter**
- U-shaped tube to **measure the pressure** to be adjusted beyond the valve
- **Burner control unit** with measuring and test points
- Boiler control panel with switch, thermostat and connection points
- 10-switch console that **generates failures**
- **Compressor-controller** unit for **gas supply simulation**

➢ *Training activities:*
- Study of the boiler and understanding the manufacturer's electric diagrams
- **Electrical connecting and measurements**
- **Mechanical adjustments**
- **Gas adjustments** (valve, pressure controller, pressure switches) with **pressure and flow control** (gas supply simulation)
- Observing the **operating cycle** and **analyzing parameters**
- **Failure diagnostics** and troubleshooting procedure

➢ *Key points:*
- Completely safe due to **fuel-free operation**, as gas is replaced by compressed air
- The system works without water, exchanger or flue: **low installation and maintenance costs**

➢ *Reference:* **SF20:** SimGaz50, 50kW single stage gas burner simulator

Simelec, Simregul & 3-way valve – Trainers for studying the control accessories of a water-based heating system



➢ *Features:*
- Control and safety **thermostats**
- **Switches and relays** (hot water priority, etc.)
- **Boiler controller, and heating and Domestic Hot Water circuit**
- **3-way valve** (mixing and recirculating)

➢ *Training activities:*
- Study of several components of heating circuits
- **Electrical wiring of boilers and heating circuit components**
- Failure **diagnostics** and troubleshooting
- **Configuration** of the boiler **controller** and heating circuit
- Study of the **operating modes of motorized 3-way valves** (mixing, recirculating, etc.)

➢ *Key points:*
- **Failure consoles** for diagnostics activities
- The trainers may be **used with SimGaz50 and SiFuel50** for boiler control scenarios

➢ *References:* **SF00:** Simelec, Simregul and protections – **SF01:** 3-way valve (Optional)

Refrigeration assembly trainer - Assembly, wiring and testing of cooling units and refrigeration control devices

➢ *Features:*
- **Commercial refrigeration** (R134A refrigeration unit…)
- Command and **Control** (temperature controller)
- Sensors (pressure, temperature)
- Low voltage switchgears

➢ *Training activities:*
- HP and LP **piping,** adding a valve
- Diagrams and **electrical wiring**
- Pressurization and leak detection
- **Set up** (adjustments, gas recharging)
- **Thermodynamic** measurements
- Set up of a controller with a draining evaporator
- **Fluid recovery**
- Electrical and refrigeration certification

View of the evaporator

➢ *Product strengths:*
- Compact size for economical use (few consumables)
- Training course covering all operations of refrigeration units

➢ *References:* **FM10:** Refrigeration assembly trainer – **FM11:** Tool kit for refrigeration certification – **FP19:** Basic refrigeration tools – **FM12:** Spare parts kit for refrigeration assembly trainer – **FM13**: Removable box with electrical components

Positive cold room - Food preservation at positive temperatures

➢ *Features:*
- **Commercial refrigeration** (R134A refrigerated unit)
- Thermal insulation (65mm-thick cold room)
- Control (**temperature controller**)
- Sensors (pressure, temperature)
- **Communication** and supervision
- Fluid system, electrical circuits and their equipment

➢ *Training activities:*
- **Commissioning** & configuration
- **Electrical and refrigeration maintenance**
- Electrical and refrigeration circuits
- Enthalpy diagram, Energy balance and performance ratios
- Forecasting operation modes
- **Electrical certification**...

➢ *Key points:*
- Possibility to order the equipment as an assembly kit (**detailed assembly instructions)**
- Real-life situation and real sizing (restaurant cold room)
- **Studying a low-cost industrial cold room**
- Resistance for simulation of temperature variation in the cold room

➢ *References:* **FP15+FP16-k:** Positive cold room assembly kit - **FP15+FP16:** Positive cold room (assembled) – **FP17:** 500W heater into the cold room (Optional) – **FP18:** Flowmeter for refrigerant (Optional) – **FP12:** Communication-capable controller (Optional)

➢ *References for instrumentation:* **FP11:** Data logging and teleprocessing unit for cold rooms – **PC22:** 4-channel temperature recorder and data logger (with 8 thermocouples probes and data-acquisition software for PC)

Negative cold room - Food preservation at negative temperatures

➢ *Features:*
- **Commercial refrigeration** (R404A)
- Thermal insulation (100mm-thick cold room)
- Control (**temperature controller**)
- Sensors (pressure, temperature)
- **Communication** and supervision
- Fluid system, electrical circuits and their equipment

➢ *Training activities:*
- **Commissioning** & configuration
- **Electrical and refrigeration maintenance**
- Electrical and refrigeration circuits
- Enthalpy diagram, Energy balance and performance ratios
- Forecasting operation modes
- **Electrical certification**...

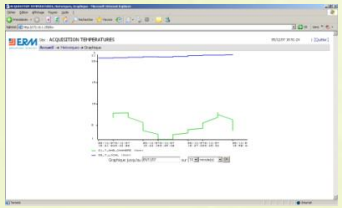
assembled or to be assembled

➢ *Key points:*
- Possibility to order the equipment as an assembly kit
- Real-life situation and real sizing (restaurant cold room)
- **Studying a low-cost industrial cold room**
- Resistance for simulation of temperature variation in the cold room
- **Detailed assembly instructions**

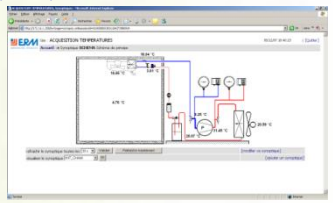
➢ *References:* **FN15+FP16-k:** Negative cold room assembly kit – **FN15+FP16** Negative cold room (assembled) – **FP17:** 500W heater into the cold room (Optional) – **FN18:** Flowmeter for refrigerant (Optional) – **FN12:** Communication-capable controller (Optional)

➢ *References for instrumentation:* **FP11:** Data logging and teleprocessing unit for cold rooms – **PC22:** 4-channel temperature recorder and data logger (with 8 thermocouples probes and data-acquisition software for PC)

Data logging and teleprocessing unit (FP11)

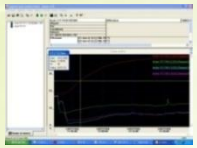


Graphical measurement record



Schematic layout: real-time data (evaporator's temperature, cold room, expansion valve entry, evaporator exit…)

4-channel thermometer with datalogger (PC22)



→ With 8 thermocouple probes and acquisition software

Refrigeration & Air-conditioning

New

Commercial/Industrial refrigeration unit – Multi-compressor system supplying several refrigeration units

➢ *Features:*

- **Refrigeration unit** (dual-compressor refrigerating group using R404A, suction accumulator, oil separator, fluid reservoir, filter dryer, etc.)
- Condenser (air-cooled) and evaporator (air-cooled)
- Refrigeration applications (cold room, display case, ambient air volume)
- Expansion valves (thermostatic, electronic) and evaporation pressure control valves
- Control (**PLC for the refrigeration unit, controllers for display cases, cold rooms and room temperature**)
- Sensors (pressure, temperature)
- **Communication** and supervision
- Fluidic and electrical circuits and their equipment
- **Hydraulic circuit** components (hot water production by **heat recovery**)

➢ *Training activities:*

- Introduction to **refrigeration units**
- Electrotechnical measurements
- Hands-on training with refrigeration components
- **Refrigeration measurements and enthalpy chart design**
- **Refrigeration and electrical** troubleshooting and **maintenance**
- **Commissioning & configuration**
- **Energy balance** and computation of performance ratios

Carel Plantwatch Web Supervision

Measurement console

➢ *Key points:*

- **Real-life situations and actual sizing** (e.g., Mini-market refrigeration unit with cold room, refrigerated display case and ambient cooling)
- Resistance for **simulation of temperature variations** in the cold room
- **More display cases, cold rooms and "free" evaporators may be added**
- Hot water production by **energy recovery** (option)

➢ *References:* **CF10:** Dual-compressor Inverter refrigeration unit with remote air-cooled condenser and helical fan – **CF12:** Display case with thermostatic expansion valve – **CF13:** Negative cold room with thermostatic and electronic expansion valves, and ambient evaporator with thermostatic expansion valve – **CF15:** Heat recovery unit producing hot water – **PC22:** 4-channel thermometer with PC acquisition and display (delivered with 8 thermocouple probes and PC acquisition software)

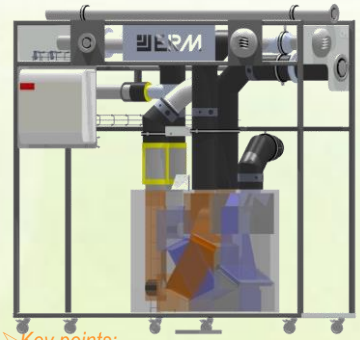
Monosplit reversible air-conditioner with inverter – Training system to study a monosplit reversible air-conditioner DC inverter using R410

- → Studying a monosplit reversible inverter air conditioner in real conditions
- → Measurements (voltage, amperage, temperature, hygrometry, HP and LP manometers)
- → User-friendly data-acquisition of operating parameters on Labview
- → References: **MO20** Monosplit reversible air conditioner with inverter – **MO21** Data logger and tele-monitoring via Ethernet (embedded web server) – **AQ10** USB data logger – **AQ11** Differential voltage probe for USB data logger – **AQ12** AC current clamp for USB data logger

Page H10

Ventilation & Air treatment

Residential CMV – Study and implementation of residential ventilation solutions



➢ *Features:*

- Single-flow humidity-sensitive CMV, consumption level B (with humidity-sensitive air inlets)
- High-performance double-flow CMV
- Thermal, aeraulic and electrical measurements

➢ *Training activities:*

- Study of **residential ventilation solutions**
- Installation, commissioning & configuration (airflow balancing, etc.)
- **Electrical and thermal** diagnostics and **maintenance**
- Aeraulic, thermal, hygrometric and electrical measurements

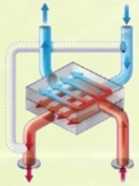
➢ *Key points:*

- **Real-life training scenarios** based on a villa
- **Commissioning on a frame under realistic conditions**
- Professional components for an **optimally cover professional skills, types of ducts, etc.**
- **Double-flow CMV unit prepared by ERM for measurements with portable devices**

➢ *References:* **VM10:** Single-flow humidity-sensitive CMV, consumption level B, and its electrical cabinet – **VM11:** Double-flow CMV and its electrical cabinet – **VM12:** Commissioning frame for the single- and double-flow CMV – **VM15:** CMV measuring instruments (Kimo HDA thermo-hygrometer, Kimo VTA thermo-anemometer and Kimo K35 airflow cone, Kimo MPA manometer, Kimo SDA sound level meter, Chauvin Arnoux clampmeter)

Montage Hot and cool air generator for indoor use (VM24)

Double flow Controlled Mechanical Ventilation system & Thermal regulations – Studying a Controlled Mechanical Ventilation system for low energy consumption buildings



- → Studying a real ventilation system
- → Measurements: temperature, pressure, air flow, hygrometry, rotation, speed, power and consumption
- → References: **VM30:** Double flow CMV & Thermal regulations with the following sensors: pressure (x2), flow (x1), hygrometry (x1), temperature (x4) to be connected to a data logger – **VM21**: Portable instrument for operational, thermal and air flow data logging – **VM24**: Hot and cool air generator for indoor use (without external air inlet) – Other references on page H9

Page H9

CTA Flex - Air handling system with heating, cooling, humidifying, recirculation and industrial supervision

➢ *Features*

- **Blowing and extraction**
- **Mixing** (mixing case, 2 or 3 way)
- **Filtration** (medium, high or very high efficiency)
- **Heating** (hot water coil or electric coil)
- **Cooling** (cold water coil)
- **Heat recovery** (plate heat exchanger)
- **Sound attenuation** (sound trap)
- **Steam humidification**
- **Sensors** (temperature, pressure, hygrometry...)
- **Centralized Energy Management** system (CEM)

➢ *Training activities:*

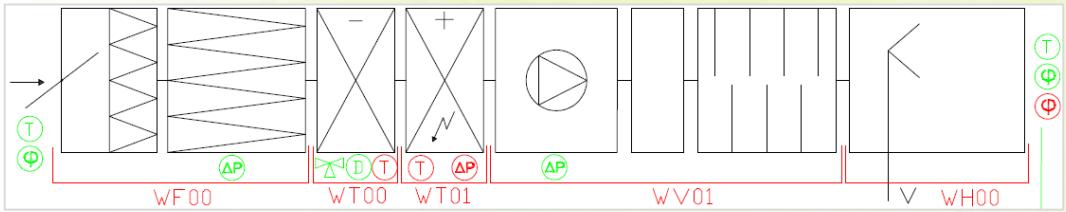
- **Commissioning** & Configuration
- Climatic and electrical **maintenance**
- Analysis of the refrigeration, electrical and air flow circuits
- Energy balance and calculation of the performance ratios
- Forecasting the operating conditions

➢ *Key points:*

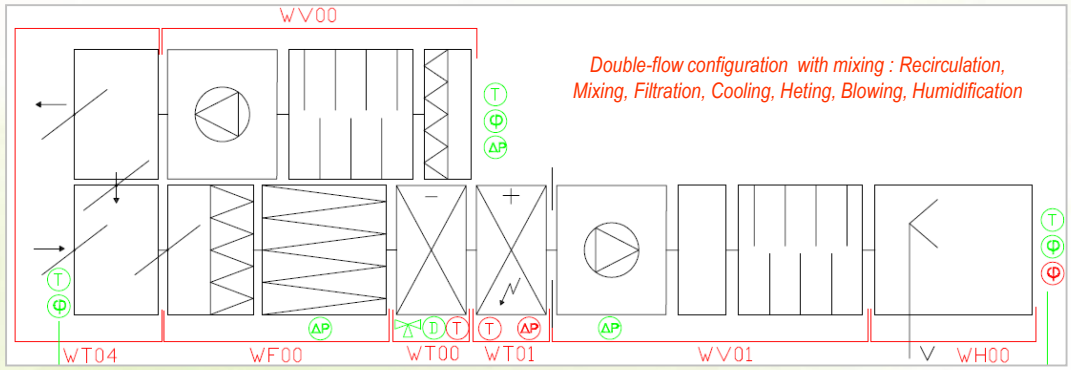
- Analyzing the functions of a CEM system for the 3 types of configuration (single flow, double flow with mixing, double flow with heat recovery)
- **Professional equipment** used in collective buildings

➢ *References:*

WA10: Control box with Centralized Energy Management (CEM) – **WV01:** Blowing case (blower + sound trap) – **WV00:** Recovery ventilation case (Recovery ventilation unit + sound trap) – **WF00:** Pre-filttration and filtration case – **WT00:** Cold water coil case – **WT01:** Electric coil case – **WT02:** Hot water coil case - **WT03:** Heat recovery case – **WT04:** 3-way mixing case (Recirculation/Emission/Blowing) – **WH00:** Steam humidification case – **WT05:** Heat pump for hot or cold coil – **WM00:** Measurements case with temperature, flow and pressure sensors – **WM01:** Measuring instruments for pressure, flow, temperature, hygrometry (Kimo HDA Thermo-Hygrometer, Kimo VDA Thermo-anemometer hot-wire, Kimo MPA Micro-manometer) – **WM02:** Measuring and datalogging instruments for pressure, flow, temperature, hygrometry (with software for data transfer to PC: Kimo DIAM-Log)



Single flow configuration: Filtration, Cooling, Heating, Blowing, Humidification



Double-flow configuration with mixing : Recirculation, Mixing, Filtration, Cooling, Heting, Blowing, Humidification

CTA Compact – Air handling system with energy recovery, recycling, heating, cooling, humidifying and industrial supervision

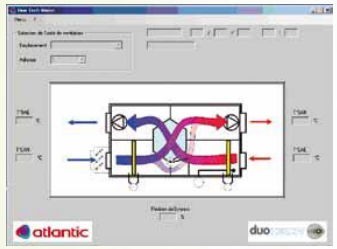
➢ *Features:*

- **Blowing and extraction**
- **Mixing and heat recovery** (plate heat exchanger)
- **Filtration** (medium, high efficiency)
- **Heating** (hot water or electric coil)
- **Cooling** (cold water coil)
- **Heat recovery** (plate heat exchanger)
- **Steam humidification**
- **Sensors** (temperature, pressure, hygrometry...)
- **Centralized Energy Management** system (CEM)

Control and configuration box

➢ *Training activities:*

- Analyzing the functions of a air-handling system
- Study of **PLC and communication network** in a building (CEM)
- **Commissioning** & **Configuration**
- Climatic and electrical **maintenance**
- Analysis of the **refrigeration, electrical and air flow circuits**
- Energy balance and calculation of the **performance ratios**
- Forecasting the operating conditions



Configuration and supervision software

➢ *Key points:*

- **Professional equipment** used in collective buildings
- **Customized measurements**
- Easy-to-use and friendly supervision software
- Open system to main communication protocols (**Ethernet, LonWorks, BACNet, Modbus, KNX**)

➢ *References:* **CC00** High-performance Double-flow air-handling system with: Exchanger 90%, CC motors with low-consumption electronical commutation (Flow up to 1000m³/h), Filtration G4+F7 on blowing and filtration G4 on return, Bypass, Power box with communication capable PLC and temperature & pressure sensors, Control and configuration box, configuration and supervision software on Modbus local network – **CC15** Flexible connection (6 m. long, diam. 315mm), from the Air-handling unit to an external wall – **CC10** Electric coil for pre-heating 3.6kW and post-heating 6kW – **CC11** Water coil for post-heating or cooling – **CC12** Mixing case with antifreeze register and one-way motorized shutters – **CC13** Steam humidification case – **PC30** Air/Water reversible inverter 10kW chiller – **CC01** CO2, hygrometry and presence sensors for advanced control – **CC02** KNX gateway (supervision application not provided) – **CC04** Modbus TCP/IP Module on PLC – **CC05** BACNET IP Module on PLC – **WM01/WM02** Measuring instruments (see CTA Flex references)

Controllers for Heating and Cooling Systems

Chiller and heat pump controller

→Study and configuration of the controller (**Carel uChiller**)

→Controlled devices:

- **Compressor**
- **Condensation** fan
- Cycle **reversal** valve
- Water **circulating pumps** for evaporator and/or condenser and blower (air-air)
- **Anti-freeze resistors**
- **Alarm**

→Input (potentiometers) and output (indicator lights) simulation

→Reference: **CA//SIMMCHSE**

Stand-alone cooling unit controller

→Study and configuration of the controller (**Carel MPXPro**)

→Controlled devices: **Compressor**, **Evaporator**, **Defroster**, **Alarm**, **Lighting**

→**HACCP** temperature traceability

→Input (potentiometers) and output (indicator lights) simulation

→Reference: **CA//SIMMPXPRO**

Air handling unit controller

→Study and configuration of the controller (**Carel pCOXS**) and speed drive (**Carel NXP**)

→Air handling unit control with fan control via speed drive

→Input (potentiometers) and output (indicator lights) simulation

→Reference: **CA//SIMNXLPCO**

Refrigeration unit controller

→Study and configuration of the controller (**Carel pCOXS**)

→Controlled devices: **Compressors**, **Condensers**, **Alarm**, **Loss of coolant**

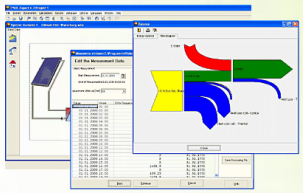
→Inverter management of compressors and fans

→Input (Potentiometers) and output (Indicator lights) simulation

→Reference: **CA//SIMPCOXS**

Thermal engineering Fundamentals

Software for calculation and dynamic simulations for solar heating, photovoltaic and heat pump systems



→Dimensioning and efficiency of solar heating systems (domestic hot water and heating), photovoltaic systems (grid-connected) and heat pumps

→Typical examples provided for educational use

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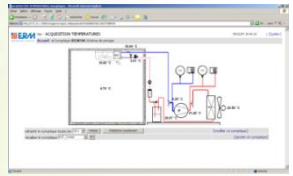
Energy diagnostic

Data-acquisition, logging and Ethernet remote monitoring unit

➢*Specifications:*

- Mobile cabinet for acquiring and logging all types of data used in thermal engineering
- **16 universal analog inputs (0/10V, 4/20mA with external shunt, PT1000, PT100, CTN, etc.)**
- Data exporting via **USB**, RS232 and Ethernet
- **Teleprocessing software included** (49 variables, Web Server, Logs, Alerts, etc.)



➢*Training activities:*

- Installing acquisition and teleprocessing systems on HVAC systems
- Study of industrial communication solutions

➢*Key point:* Many inputs/outputs and communication options

➢*Reference:* **PC21:** Data acquisition, logging and Ethernet remote monitoring unit

Thermo-hygrometer (Kimo HRA & Kimo HRS)

Hotwire electronic thermo-anemometer (Kimo VTA & Kimo VTS)

Anemo-manometer (Kimo MPA)

1- or 2-channel thermometer (Kimo TKA, TKB, TK1 & TK2)

4-channel thermometer (Kimo TM200)

Thermo-hygro-mano-anemometer (Kimo DIAME)

Laser sighting infrared thermometer (Kimo Kiray200)

TRMS AC, DC, AC+DC compact digital clamp multimeter (Chauvin Arnoux F205)

Instruments & tools : See details on pages I4 to I7

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