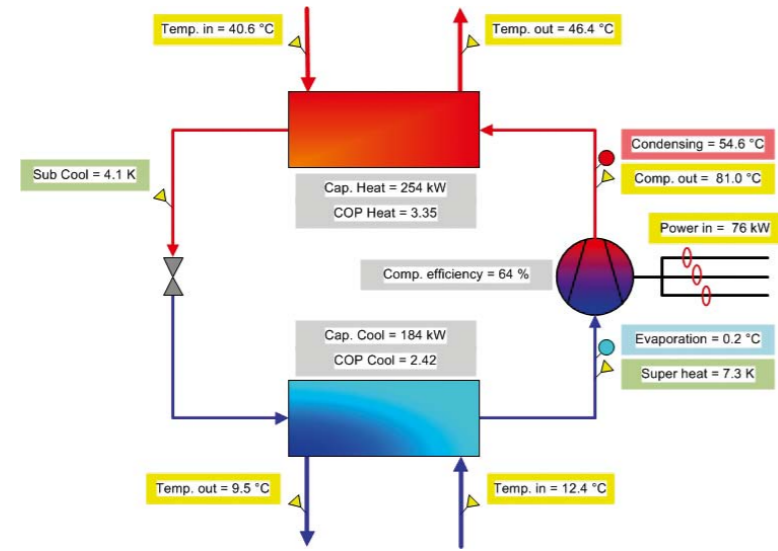


The energy profile as a basis for optimisation

## Applications

The ClimaCheck Performance Analyser Pro can be used to document all types of compressor-driven refrigeration, air-conditioning and heat pump equipment:

- Product and system development - leading manufacturers use ClimaCheck solutions for development and product quality control.
- Commissioning/warranty inspections - after installation of new equipment or at the end of the warranty period, ClimaCheck confirms if the plant is running at the rated capacity and energy efficiency.
- Performance Inspections - EU directives require regular energy inspections of air conditioning units over 12 kW. ClimaCheck provides accurate and unbiased performance validation.
- Energy optimisation - ClimaCheck provides high quality decision support prior to energy-efficiency measures in cooling systems and heat pumps. Internet access allows experts to study and diagnose operation effectively from anywhere in the world.
- Troubleshooting - ClimaCheck makes troubleshooting and fault correction an easy process, minimising engineers' time and energy costs, whilst extending plant life.
- Preventive maintenance and service - ClimaCheck can be used for temporary or continuous monitoring of cooling and heating systems. Predefined performance reports and alarm levels ensure the equipment works efficiently.



System Flow Chart with dynamic sensor readings

## ClimaCheck analysis provide accurate data for:

- Expansion valve function/adjustment
- Precision refrigerant charging
- Compressor efficiency
- Evaluating heat exchanger performance and secondary flow rates
- Verification of control functions and system protection
- Evaluation of Performance: Capacity, COP/EER and electrical power/power factor

## Measurements

The ClimaCheck method measures key parameters in the refrigeration system and precisely analyses the process. A basic process requires:

### Temperature

- Compressor discharge line
- Liquid refrigerant before expansion device
- Compressor suction line
- Evaporator entering and leaving water / air
- Condenser entering and leaving water / air

### Pressure

- High and low compressor pressures

### Electrical measurements

- Current, voltage, power factor, active power

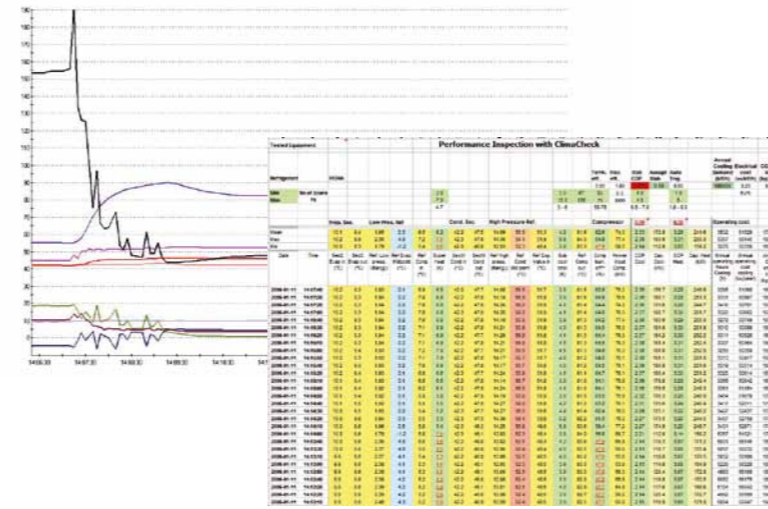
## Results

The above measurements allow all performance parameters to be calculated and displayed, including:

- Cooling and heating capacity ( $\pm 7\%$ )
- Electrical power input ( $\pm 2\%$ )
- Coefficient of Performance / EER ( $\pm 5\%$ )
- Compressor isentropic efficiency
- Evaporating / condensing pressure and temperature
- Discharge temperature
- Superheat / sub-cooling
- Entering and leaving evaporator air / water temperature
- Entering and leaving condenser air / water temperature
- Temperature differences and flow rates in evaporator / condenser

## Professional results

In 2006, the ClimaCheck method was evaluated by the Royal Institute of Technology in Stockholm. A survey covered 164 refrigeration, air conditioning and heat pump systems with a capacity between 12 and 900 kW. The resulting ClimaCheck Performance Inspections showed that 87% of the systems were not performing to specification. Simple adjustments gave on average a 10% cut in electrical consumption, in many cases up to 30%. Such energy savings directly resulted in reduced running costs and environmental impact.



Documentation of capacity, efficiency and running cost

## Presentation of data

ClimaCheck offers solutions for local analysis via PC or for remote analysis, monitoring and alarms via the Internet. Flow charts, tables and graphs provide a clear picture of a system's operating conditions, as illustrated above.

## ClimaCheck PA Pro module

ClimaCheck's Central Unit is a powerful measuring device with a web-browser and ports for communication with both PC and other devices. Several ClimaCheck modules can be connected in "master / slave" configuration.

### Basic Facts

- Temperature Inputs: 8 PT 1000 (-50°C to 150°C), additional inputs via RTD-04 expansion modules
- Analog inputs: 8. Selectable for 0-10 V / 0 (4) -20 mA
- Digital inputs and outputs: 8 digital inputs and 3 digital outputs
- Internal memory: 1 MB (max circa 8000 measurements)
- Communication: Ethernet, RS485, RS232
- Voltage: 24 VDC, 3 W
- Accuracy: Temperature  $\pm 0.25^\circ\text{C}$ , Analog Input  $\pm 0.1\%$  FS
- ClimaCheck EP Pro electricity / energy class B,  $\pm 1\%$

## Temporary and fixed measurement

ClimaCheck PA Pro options:

- **Portable Measuring System** - a complete mobile measuring system with analogue and digital inputs, all in a robust case with wheels/handle

- **Fixed installation System** - ClimaCheck PA Pro in pre-wired enclosure for easy installation of local or remote monitoring
- **Integration with control and building supervision system** - Our software can be integrated with most monitoring systems (BMS) via standard interfaces (OPC, DDE, Modbus or text files).

## ClimaCheck PA Pro portable Measurement System (Part No: 100 206)

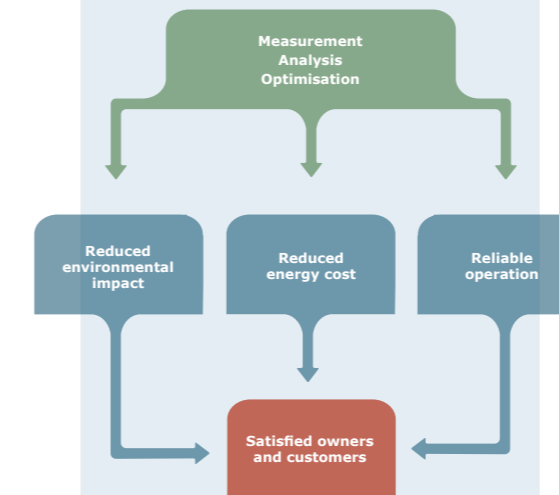
Durable case with room for sensors and laptop. Dimensions: 501 x 279 x 193 mm, weight: 11 kg. The following equipment is included:

- ClimaCheck PA Pro module
- Pressure sensors: 0-10 and 0-35 bar (g),  $\pm 1\%$
- Temperature sensors: 8 PT1000 Class A
- Electrical power meter: EP Pro Class B,  $\pm 1\%$
- Current clamps (100:1 A), voltage probes, cables, mounting materials for sensors

## ClimaCheck PA Pro Fixed Installation (Part. No. 100 950 (LAN), 100 955 (Modem))

Enclosure(IP55 or, on request IP65) with the following equipment:

- ClimaCheck PA Pro module
- Pressure sensors: 0-10 and 0-35 bar (g),  $\pm 1\%$
- Temperature sensors 8 PT1000 Class A
- Electrical power meter EP Pro Class B, current transformers
- Fuses, power supply 24 VDC



The key to energy efficiency

## Accessories

ClimaCheck offer a complete range of sensors and accessories:

- Modems - GSM/3G/HDMA
- Flow and energy meters for water
- Humidity sensors
- Wireless sensors for temperature, humidity, carbon dioxide level and more

## ClimaCheck On-Line Web Services

ClimaCheck On-Line is an Internet service for continuous analysis of and access to data. If deviation in performance or changes in energy consumption pattern occur, SMS and/or e-mails are sent to responsible persons.

## Training and Analysis

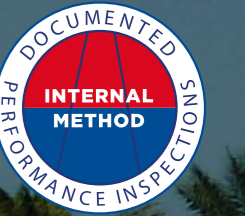
ClimaCheck offers analysis support and specialised training in measuring, analysing and optimisation of refrigeration systems.



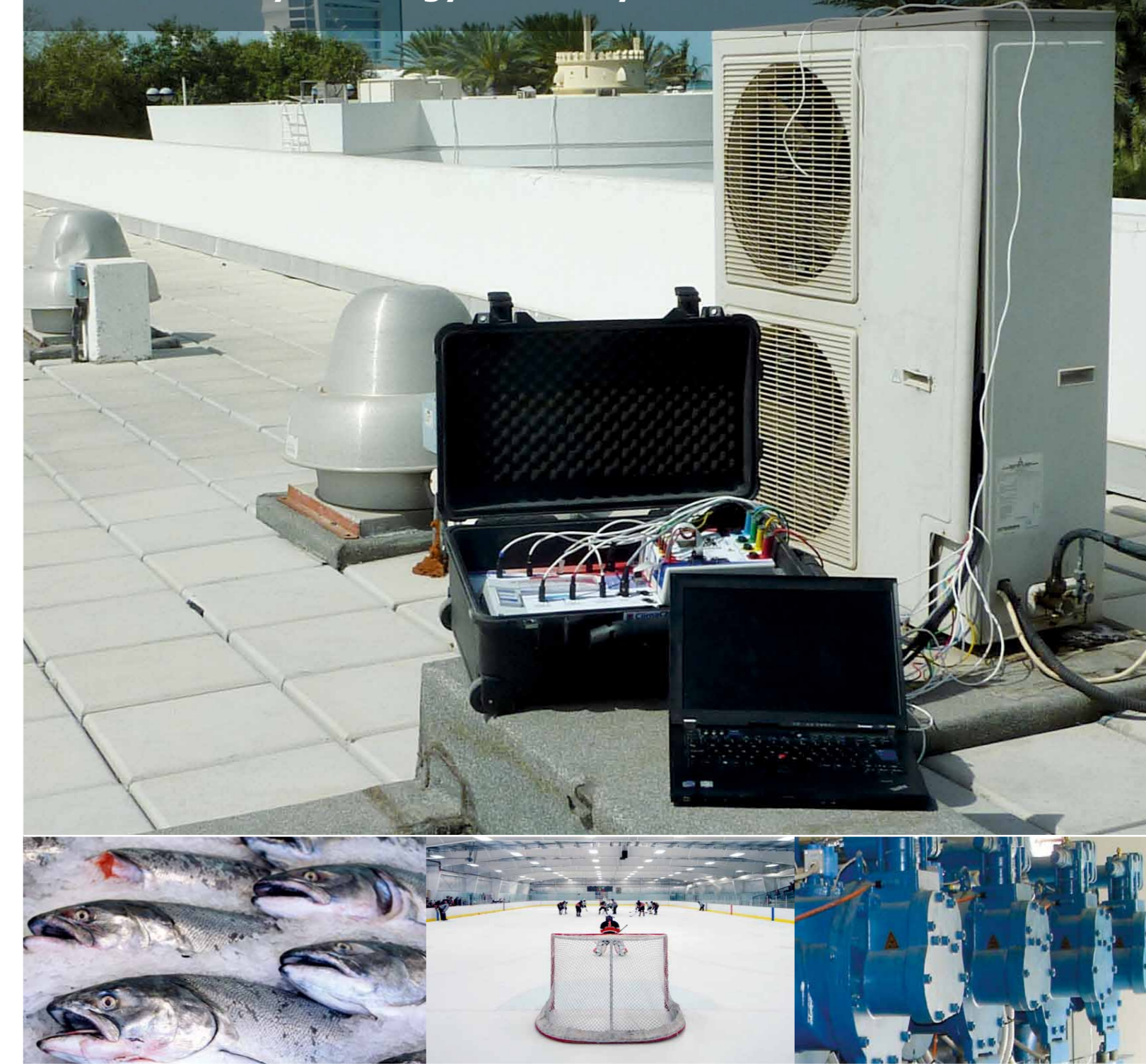
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# CLIMACHECK PERFORMANCE ANALYSER

The key to energy efficiency



ClimaCheck  
www.climacheck.com



## THE CLIMACHECK METHOD

### For Cost-Effective Performance Analysis

Did you know that 15-20% of total world energy consumption is used for refrigeration and air conditioning? Refrigeration compressors are used throughout society for cooling foods and processes, air conditioning, heat pumps and dehumidifiers. For the supermarket or building operator, the electricity cost for cooling is often a hidden cost within the entire bill, but often represents 40-60%. The absolute majority of cooling systems are not working as effectively as they should, with higher energy costs and increased carbon dioxide emissions as a result.

To reduce power consumption, a clear picture of how the system is working is required. Good analytical tools and methods are the basis for optimising the operation and minimising downtime. It has previously been difficult to cost-effectively measure the performance of refrigeration systems in operation. Now there is the **ClimaCheck** method.

#### The unbiased ClimaCheck method

The ClimaCheck method allows you, an owner, installer, consultant or manufacturer to analyse and evaluate virtually all types of air conditioning and refrigeration systems.

In a basic cooling process analysis is based on ten measuring points that are connected to the system to collect the necessary data. ClimaCheck directly analyses the data and documents performance. You then have a complete picture of how the system is working and the adjustments needed to boost energy efficiency.

The ClimaCheck method is based entirely on thermo-physical data for the refrigerant and fundamental energy laws. This is a tool to document refrigeration system performance that is independent of system input or component suppliers, and is therefore totally unbiased.



#### A Winning Approach

The ClimaCheck Method, patented in 1986, has been used since then for thousands of system checks by manufacturers, universities, test institutes and refrigeration technicians in over 20 countries. Hundreds of service contractors and consultants have seen the benefits of this new way of working. Several leading industry suppliers of heat pumps, air-conditioning and refrigeration systems also use ClimaCheck to measure and document the performance of their products.

In 2009, the ACR News Journal at the UK's largest trade show awarded ClimaCheck Performance Analyser the "Refrigeration Product of the Year". The basis of the award was "the method's large potential to save energy in existing refrigeration plants".



## FLEXIBILITY AND CONTINUITY

ClimaCheck offers total solutions for performance inspection, analysis and monitoring of heat pumps, air-conditioning and water chillers. For quick system measurements and adjustments during service or inspection visits, use our *portable field case* version. Within 30 minutes of connecting sensors, you'll have a complete analysis and documentation of plant performance and all component functions. This portable solution provides retail and property owners, contractors and consultants immediate and exact evidence of how well heat pumps, refrigeration and air conditioning systems are running.

A *fixed installation* provides continuous monitoring of energy-consumption, compressor and system performance. Via the Internet, end-user's staff, service companies and consultants log in and access real-time information from any system. Pre-defined energy reports provide current information about the plant's energy consumption.

If compressor efficiency drops, a refrigerant leak develops, or the "energy profile" falls outside of the norm, ClimaCheck automatically sends an alarm. Responsible staff receive information via email or SMS and can directly log in from a computer or mobile phone for full information.



## ADVANTAGES

**A method that enables you to reduce energy costs and environmental impact whilst increasing customer satisfaction**

### Reduced repair costs and longer plant life-time expectancy

Break-downs in refrigeration and air conditioning systems require significant resources to address. ClimaCheck's continuous monitoring allows all problems to be addressed long before shutdowns or breakdowns. You can minimise service visits and maintenance costs. You can forward plan component replacement as degradation sets in to maintain system energy efficiency and to reduce energy costs, whilst increasing plant life-time.

Reduced failure rates also reduce product loss, production downtime and loss of goodwill. For those working with refrigerated food, air conditioning, and process or data cooling, improved reliability improves your business and customer relationships.

### Reducing energy consumption and environmental impact

Is it your goal to reduce the organisation's energy consumption? Are you considering optimisation of an existing plant or planning a new investment? Precisely knowing the current performance status is the best basis for correct decisions.

ClimaCheck documents performance and provides information on potential system weaknesses. You can directly compare the cost of energy optimisation against calculated savings once the performance base line is documented. On project completion you have a record of improvements, ensuring your investment is paying back.

Studies and practical experience show that the ClimaCheck method often reduces energy consumption by one third. Where a fifth of world energy consumption is used for cooling, these energy reductions directly reduce global carbon dioxide emissions.



Energy optimisation in retail



Unbiased data analysis



Performance inspection



Energy and performance monitoring



Education and training



24/7 access



Performance evaluation of CO<sub>2</sub> plant



Manufacturers R&D facilities around the world



Troubleshooting and optimisation