Field Manual

ClimaCheck

Performance Analyser
ClimaCheck PA Pro II

Measuring and Analysing System for Refrigeration, Air-conditioning and Heat Pumps

Updated for software v3.50

2015-02-20

www.climacheck.com

Safety Precautions

Read the instruction manuals for all relevant equipment carefully before starting to use ClimaCheck Performance Analysing systems.

ClimaCheck PA Pro II is a measuring and analysing system developed to give detailed evaluation of refrigeration, air-conditioning and heat-pump systems in development laboratories, production tests and in the field.

If equipment is used in a way not specified by producer the protection and safety provided may be impaired.

Certifications/licenses are required in most countries for activities related to electrical systems, pressurised systems and systems charged with refrigerants that have environmental impacts and/or flammability.

ClimaCheck products are only intended for use by competent technicians/engineers complying with local requirements for certifications/licenses.

Any work with electricity, pressurised systems or refrigerant involves potential dangers to human health and system integrity if not conducted with caution. Always inspect the equipment for damaged cables or other components before use. For many installations loss of product or disturbances in operation incurs high costs. ClimaCheck assumes no responsibility for injuries or costs that may occur as a result of failures in connection with measurements. The user must evaluate whether an inspection can be carried out without risk of injury and/or damage. Measurements should only be carried out when it can be done under safe working conditions and without risks.

Note - additional manuals

Detailed Manuals for Hardware and Software is available under Help menu in ClimaCheck software.

These pdf files can also be found under the program files directory where ClimaCheck is installed. Path can be slightly different in different versions of Windows but typically program files\climacheck\help.

ClimaCheck Quick Guide

TT_6/TT_RSecW_in   TT_7/TT_RSecW_Out   TT_1/TT_Rcomp_out   AI1/PT_RHP

EP_Comp

TT_3/TTR_Exp_in

TT_5/SecC_out   TT_4/TT_SecC_in   TT_2/TT_Rcomp_in   AI2/PT_RLP

Step by step standard refrigerant circuit

- Connect ClimaCheck PA Pro II to your PC with a crossed Ethernet cable. (Modern computers can often handle a normal Ethernet cable as well).
- Start **ClimaCheck** software from the desktop or the program menu.
- ClimaCheck is set up to start with a default Data Source and Template. Check that the correct Data Source and Template is selected and if not change them under the **File** menu. (To change pre-selected templates for next start go to **Settings** > **Preferences**.)
- Verify that correct Refrigerant is selected (cell to the right in tool bar). If wrong change under **Refrigerant** menu in toolbar.
- Select **File** > **Save ClimaCheck Work Book** and give the file a name.
- Select **Contact** > **Direct** to activate the connection to PA Pro.
- Select desired scan interval. Select **Start** under Scanning in the toolbar.
- Check the sensors against atmosphere pressure and room temperature.
- Attach all temperature sensors with Heat transfer paste, Al-Tape and Insulation.
- Attach pressure sensors (check for correct pressure range).
- **Always attach cables between current clamps and Power meter, before connecting the current clamps around the voltage wires.** Check that the arrow on the clamp points to the compressor.
- Press **Clean up** button in toolbar to clear from old values.
- Adjust system/load for stable operation.
- Check sub-cooling, superheat, compressor efficiency.
- Check for stability and possibility to optimise.
- Select **File** > **Save ClimaCheck Workbook** to save your results.

Sensor application validation at start-up

	Sensor	Logical check	OK/ not OK
AI1	High pressure sensor e.g. condensing temp	The condensing pressure is converted to condensing temperature in the software based on chosen refrigerant. For manual control use gauges/refrigerant "slides" or tables. If the system has fixed installed gauges/sensors compare value in ClimaCheck with gauges/sensors or service manifold. If no second meters are available check the condensing temperature versus specified or expected. This should typically be slightly above exiting air/water of condenser. If problem check that the right sensor is used (standard is 35 bar(g) otherwise configuration must be changed), correct refrigerant selected and if values is more or less fixed check that Schrader or service valve is properly open.	
AI2	Low pressure sensor e.g. evaporation temp.	The evaporation pressure is converted evaporation temperature in the software based on chosen refrigerant. If the system has any fixed installed gauges/sensors compare value in ClimaCheck with gauges/sensors or service manifold. If no second meters are available check the evaporation temperature versus specified or expected. This should typically be slightly below exiting air/water of condenser. If problem check that the right sensor is used (standard is 10 bar(g) otherwise configuration must be changed), correct refrigerant selected and if values is more or less fixed check that Schrader or service valve is properly open.	
TT1	Discharge temp.	The discharge temperature is strongly dependent on operating conditions. To identify if this value is realistic either check with independent sensor/control system or check if compressor efficiency is realistic (typically 55-75% for semi- or hermetic compressors. If discharge is low > high efficiency is indicated check that sensor is well applied and no sensors has been switched also check that there is super heat as liquid in the suction line will result in low discharge > high efficiency. Check sensor and application if this is not as expected.	
	Suction temp.	The suction temperature is normally slightly above evaporation = the superheat. This is dependent on the expansion valve setting, suction lines temperature, length and insulation. Too low super heat might indicate liquid carry over or excessive oil transport. Check sensor, application if this value is not as expected.	
	Liquid temp.	The temperature is normally slightly below the condensing. This is dependent on the type of and distance to condenser and if there is a receiver as the sub-cool = 0 in the receiver. Check sensor, application and pressure drop if this value is not as expected.	
	Power input	Check that currents are correctly measured and agree with rated currents of motor/compressor. Fans and pumps should not be included. Check power factor and voltage on meter (not available on older PA8:7). If any currents are negative or uneven, power factor not between 0.70 and 0.95 caution should be taken to ensure correct connection. If magnitude of currents or other values are not correct check connection and ratio setting for clamps.	

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Note: Areas with red side marking are related to certification and should not be changed without new date here log on changes are kept separately. Current date of changes is 2013-06-26.

1 Introduction

1.1 ClimaCheck[1]

ClimaCheck is a measuring and analyzing system developed to give detailed evaluation of refrigeration, air-conditioning and heat-pump systems in development laboratories, production tests and in the field.

The method is based on measurements in the refrigeration circuit and does not require any fixed installation of metering equipment in the system. The advantages of easy connection, immediate and detailed information makes the ClimaCheck method superior for evaluating all refrigeration, air-conditioning and heat pump systems.

An increased focus on energy efficiency can be seen in the EU Directive 2002/91/Ec on the Energy Performance of Building and several other requirements on energy performance on other markets. This directive requires annual inspections with verifications of energy efficiency of all AC systems with more that 12 kW rated capacity. Measuring with ClimaCheck gives and excellent foundation for performance inspections.

The ClimaCheck Performance Analysing method allows **complete analysis** of energy performance as well as presenting all information to validate the individual components and their optimization without the requirement of any fixed equipment making it possible to immediately identify and locate any deficiencies in the system. The method was patented in 1986 and has since been used in Sweden and internationally in the Product ETM 1500, ETM 2000, ClimaCheck PA 8:7 and now ClimaCheck PA Pro.

The PC based evaluation software that can be used with direct or remote connection to the data logging device utilizes a modern spreadsheet interface and the globally accepted equations for refrigerant properties in RefProp established by NIST (National Institute of Standards and Technologies in USA).

The use of standard "templates" tailored to give a comprehensive evaluation of anything from a simple air-conditioning split to a complex industrial refrigeration plant new era in refrigeration service. The operator does not need know-how of the calculations. Users with advanced refrigeration competence can develop their own templates for any specific need.

ClimaCheck contains functions to store and print reports including data and graphs and there is also an export to Excel feature for further processing of data.

The ClimaCheck method is suitable for almost all compressor based refrigeration processes. All suction or discharge gas cooled hermetic and semi hermetic compressors can be fully evaluated without any compressor or system specific information. For open compressors the electrical motor efficiency is given as input and for compressors with external cooling of air, water, oil or liquid injection information on the cooling need to be entered to give a full capacity and COP accuracy. For many types of systems data on compressor cooling are well known and necessary parameters are known. ClimaCheck Specialists should be consulted to give advice on non-standard systems.

For in depth information please refer to *ClimaCheck Help* under the *Help* menu in the ClimaCheck Software or the Help folder in the ClimaCheck on your PC. These contains documents with detailed information about ClimaCheck software and hardware.

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[1] ClimaCheck is a registered trademark.

1.2 ClimaCheck license

ClimaCheck software is sold as a one-computer license and each installation will require a registration key from ClimaCheck. Please contact ClimaCheck for special offers on additional licenses within the same organization.

1.3 Technical Specification PA Pro II

Dimensions	501 x 279 x 193 mm
Weight	11 kg
Supply voltage	24 VDC, 3 W
Inputs	8 x Temperature
	8 x Analogue (0...10V or 4...20mA
	8 x Digital
Output	3 x Digital
	Ethernet, RS485, RS232
Accuracy	Temperature ± 0.25°C
	Analogue ± 0.1% FS
Internal memory	1 MB (stores up to 8000 sets of data)

2 Handling and safety

- The PA Pro logger and the EP Pro power meter should only be supplied with CE/UL/CSA approved 24 volt direct current power supply supplied by ClimaCheck. The centre of the plug should have negative polarity. The current supply should not exceed 1 A.

- Always place the equipment in a way ensuring that power can easily be disconnected if needed.

- Operating temperature range for the PA Pro and the EP Pro is -20 to +50 °C. Operating temperature range for the included power supply is 0 to +40 °C.

- Operating humidity is R.H. 0 – 90 % non condensing.

- Maximum operating altitude: 2000 m

- The equipment is designed for a maximum of Pollution Degree 2.

- Always inspect the equipment for damaged cables or other components before use. If needed clean with a soft towel moistened with water and a mild detergent.

- The equipment enclosures have not been tested for UV-resistance and are thus not approved for outdoor use.

- The fuse on 24VDC s of the PA Pro and EP Pro should be 20x5 mm of the type **T 1 A L, 250 V**. The fuses for voltage measurement on the EP Pro should be 20x5 mm of the type
  - o   For 250 V marked units - **T 100 mA L, 250 V**.

- o For 300 V marked units - **T 375 mA L, 250 V**. Use only UL/CSA approved fuses. Use only UL/CSA approved fuses.

- See section 4 for important safety instructions when using the power meter EP Pro.

- If the instructions in this section and the rest of the manual are not observed, the protection provided by the equipment may be impaired.

3 Connectors overview
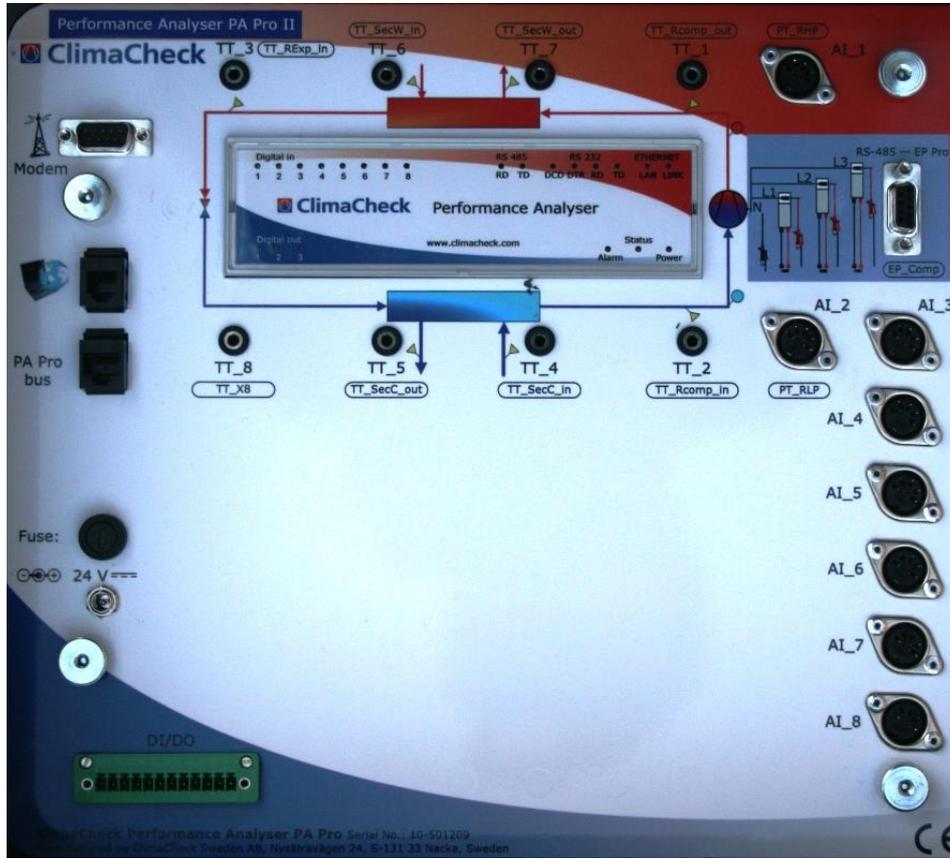
Connectors on the ClimaCheck PA Pro II panel

	Network socket. Use a crossed Ethernet cable when connecting directly to a PC.
24 V DC	24 V DC power supply. Use only approved 24 V DC supply with a maximum output of 1 A. Centre of connector should have negative polarity.
Fuse	Holder for 20x5 mm fuse of type T 1 A L, 250 V.
RS-485 – EP Pro	Serial cable connection for EP Pro II. Also supplies the EP Pro with 24 V DC. Two serial cables of different length are supplied as standard.
PA Pro bus	PA Pro specific expansion port.
Modem	Serial cable connection for wireless modem (not included as standard).
TT_1 to TT_8	3.5 mm sockets for PT1000 sensors. The system is configured with a 0.35 K offset to compensate for the cables of the included sensors.
Al_1 to Al_8	Sockets for analogue connectors 1-10 V or 4-20 mA. Supplies 12 V DC. The two included pressure sensors are connected to Al_1 and Al_2.
DI/DO	Socket for digital inputs and outputs. Not used as standard. Compatible plug available at request.

For connectors on ClimaCheck power meters please refer to ClimaCheck EP Pro II manuals.

4 Connection of power measurement

Important!

Improper use of ClimaCheck power meters may cause high voltage
build up that can be dangerous both for equipment and operators. Adhere to the
practices below to avoid this, always refer to ClimaCheck EP Pro manual, and:

- **Always connect the current clamps to the power meter (EP Pro) before they are attached around a live wire.**

- **Always remove the current clamps from the live wire before the cables to the power meter are disconnected.**

- **Incorrect connection of voltage between phase and neutral will damage the equipment.**

- **Never use the current clamps on uninsulated wires or rails.**

In addition follow the steps below to assure proper power and energy readings:

- It is important to only measure the power to the compressor. Make sure the measurement is done after the point where circulation pumps and fans are connected.

- Make sure that the voltage and current for each phase corresponds with the markings on the measuring equipment and that the arrow on the current clamps are pointing in the direction of the current.

- Make sure that the current clamps are completely closed and that the contact areas are clean.

- Check that the connections are correct by reading the voltage, current and power on the display of the power meter. If you find a problem remove the clamps and attach L1 followed by a control and the repeat the process for L2 and L3.

When the ClimaCheck EP Pro II is connected to a powered up ClimaCheck PA Pro II it is not necessary to connect it to a separate power supply. The unit will be powered over the serial cable. A separate power supply is only necessary when using the meter on its own. In advanced applications with several power meters or long serial cables it may be necessary to connect a second power supply to ensure sufficient power.

For more information about the ClimaCheck EP Pro II, see section ClimaCheck EP Pro II Manual.
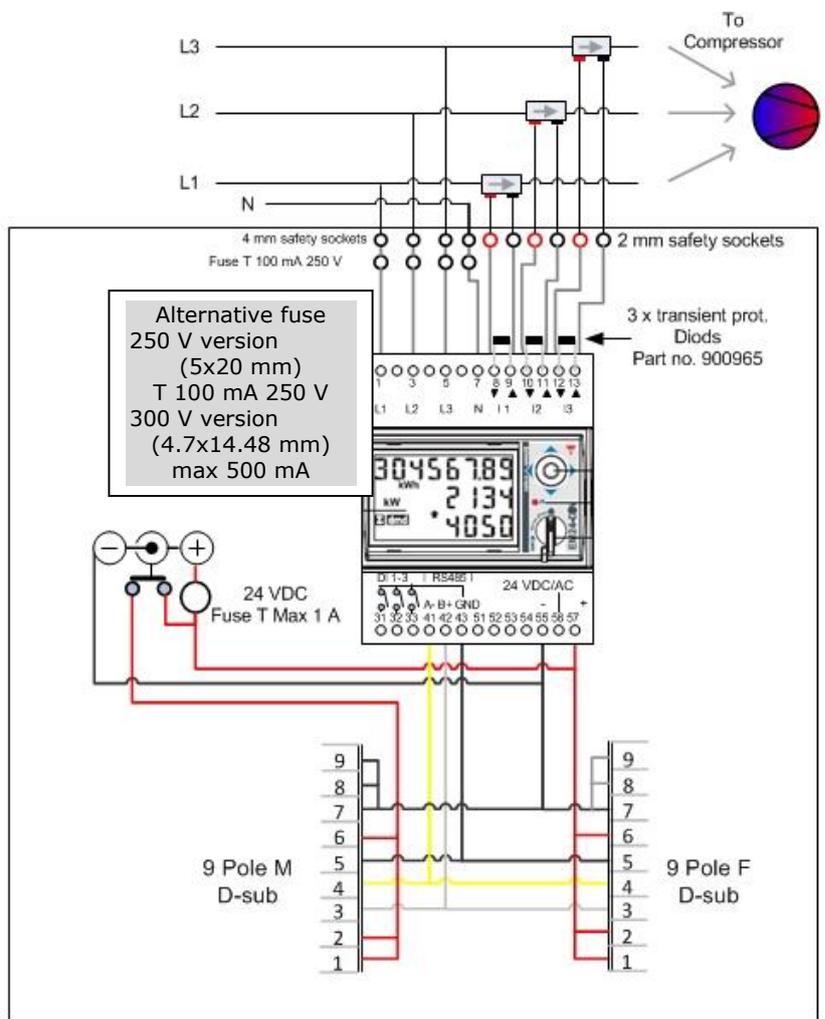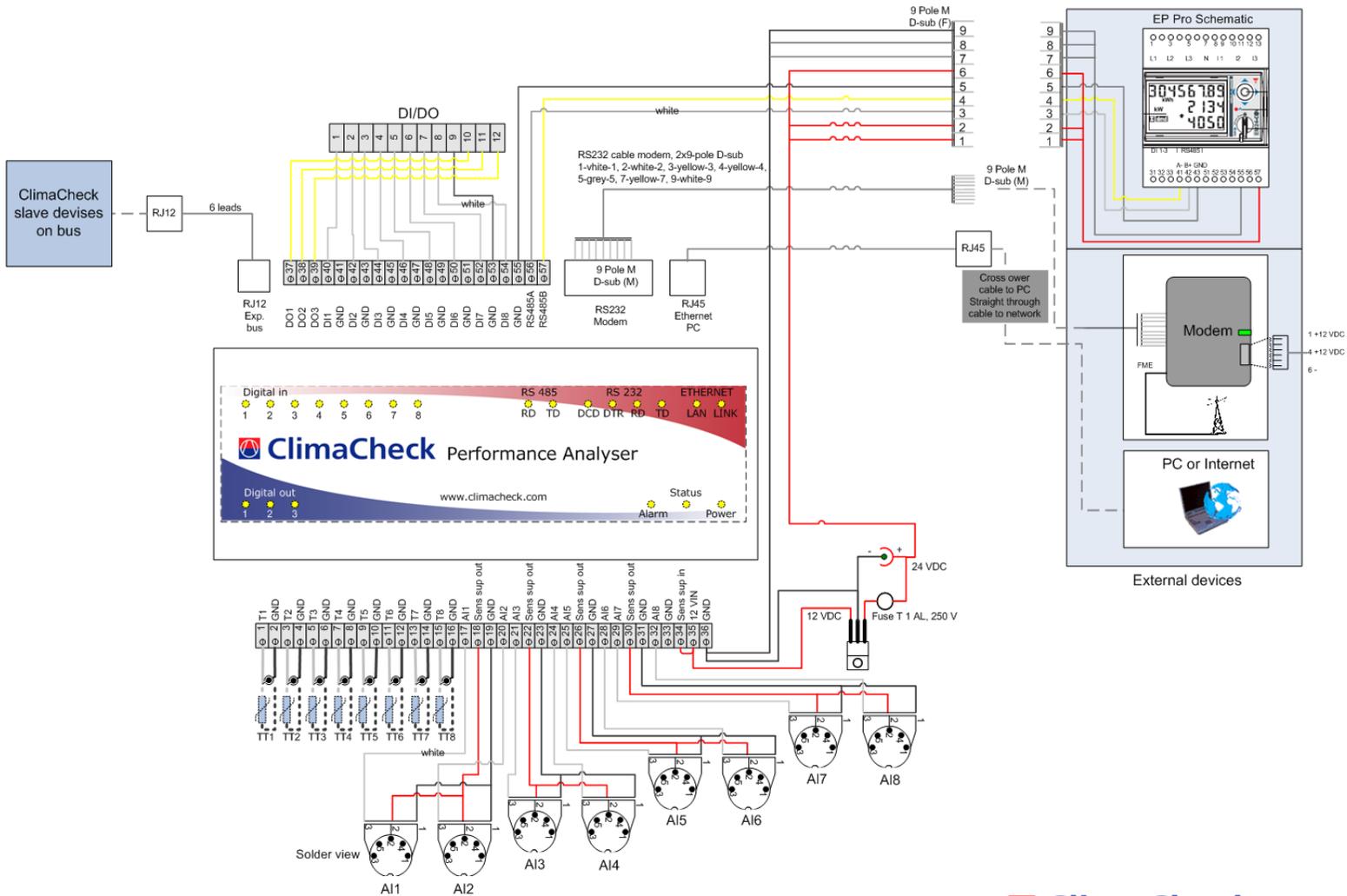
5 Electrical Drawings

ClimaCheck EP PRO II

Only intended for use by competent staff - Read Operating manual Warning!
Never apply current transformers on leads to be measured before they are connected with cables to the EP Pro instrument.
Instrument will be damaged and dangerous voltage can be generated.

Alternative fuse
250 V version
(5x20 mm)
T 100 mA 250 V
300 V version
(4.7x14.48 mm)
max 500 mA

Electrical drawing
ClimaCheck EP_Pro II
2011-10-12

6 Connection of other sensors to system

Sensors should be placed in accordance with each template. All sensors should be checked against room temperature and atmosphere pressure before being attached. If you have never worked with your ClimaCheck before assemble the entire system including software at the office to minimize the number of problems in the field.

6.1 Mounting of pressure transmitters/transducers

Pressure should be registered as close as possible to the compressor in- and outlet. Pressure drop between sensor and compressor will affect the accuracy.

6.2 Mounting temperature sensors

Temperature sensors may be mounted on the outside of piping with the ClimaCheck method due to the inherent low sensitivity to temperature errors. This is a critical advantage compared to traditional methods but should not be taken as an excuse to not follow the recommended procedures below.

Temperature sensors should be mounted:

- 10-20 cm from the compressor, flanges, valves or other objects that can act change the surface temperature compared to the inner temperature of the tube.

- Maximum contact should be ensured by:
    - Removal of any insulation and paint on the tube.
    - When mounted in pockets the sensor must be securely pressed against the wall of the pocket.
    - Heat transfer paste should always be used for surface and "pocket" mounted sensors.

- Aluminium tape should always be used for surface mounting.

- Insulation should be carefully done and diffusion tight if the surface/object is cold. The openings of dip tubes/pockets should be sealed/covered with insulation.

Apply sensors with heat transfer compound, Aluminium and insulation.

6.2.1 Required insulation are dependent on:

Many factors have an impact on required insulation to achieve good accuracy:

- dT to ambient
  High dT obviously increases the error from poor insulation
- Radiation from surrounding hot/cold surfaces

- Material type in tube
  Good heat transfer decreases the error caused by the wall from best to worse copper - iron - stainless - plastic
- Material thickness in tube
  Dimension, pressure and material define thickness thicker tube wall increase need of insulation
- Condensation
  It is important to avoid condensation on or near sensor as this will have a significant impact on temperature reading
- Ice formation
  If ice is allowed to form around sensors (condensation on cold tubes) this creates an insulation

Importance of accuracy
A service check can allow a higher tolerance for errors than an inspection to validate that performance is according to contract.
Note that even if temperatures on secondary side do not have any impact on capacity and COP of refrigeration process, they will, if nominal data is taken from manufacturers, strongly impact these reference data.

We advise common sense to be applied, with special attention to discharge and suction line sensor on the refrigerant side due to high dT and risk of condensation.

For best accuracy, remove dirt, paint and corrosion, and avoid pushing sensors inside existing insulation - cut a hole in insulation instead. Always use heat transfer paste and aluminium tape to make insulation on cold tubes so that condensation or ice formation cannot take place on sensor.

Smaller size copper tube	minimum 60 mm x 8 mm tight insulation pressed against tube (thickness 8 mm or 3 turns of insulation tape)
Larger size CU (> 35 mm/1.5")	minimum 100 mm x 8 mm tight insulation pressed against tube (thickness 8 mm or 3 turns of insulation tape)
Steel/plastic/stainless piping	minimum 15 cm x 8 mm insulation

6.3 Compensating for changes in temperature sensor cable length

No configuration has to be made if using the entire white 5 m cable, or the entire red 10 m cable, of a temperature sensor. If a cable is shortened or lengthened the change in resistance needs to be compensated for. The standard temperature offset (0.35 K) needs to be **increased for a longer cable** or **decreased for a shorter cable**. The white cable got a resistance of 0.07 K/m and the red cable 0.035 K/m (using all four leads in pairs).

***Settings for offset made in the PA Pro are permanent until changed again. For temporary compensation when using temperature sensor cable extensions see section 11**.*

To configure one of the temperature sensors connected directly to the PA Pro (number 1 to 8), follow the instructions below:

- Connect to the PA Pro to the PC.
- Open a web browser and enter the location "http://169.254.1.1".
- Login with username "config" and password "ef56".
- Choose **Settings** -> **Sensors & Actuators**.
- The temperature channels are positioned on the top left of. Click on the channel corresponding to the sensor with the changed cable length.
- Edit the value in the field next to **Offset**. Increase the standard value 0.35 if you have added cable or decrease it if cable has been removed.
- Click **Save Settings**.

The procedure for changing the offset for the temperature module RTD-04 is slightly different.

- Connect to the PA Pro to the PC.
- Open a web browser and enter the location "http://169.254.1.1".
- Login with username "config" and password "ef56".
- Choose **Settings** -> **Advanced** -> **External Units**.
- Select the RTD-04 unit you want to configure from the list.
- For each of the four temperature sensors, there is a field for the **offset**. Increase the value if you have added cable or decrease it if cable has been removed.
- Click **OK**.

6.4 Checking sensor readings

Before starting to analyse the setup the feasibility of all sensor readings should be checked. This is easiest to do under the **Input** tab. Incorrectly attached, mixed up or defect sensors will make it impossible to conduct a correct assessment of the refrigeration process.

7 Validation of measuring system

All measurement systems are dependent on good upkeep of measuring equipment and on operator not taking shortcuts when performing a performance and/or function control. ClimaCheck is designed to give the operator an easy to use system without requiring the operator to have detailed knowledge of the thermodynamic calculation method. It is recommended to check that sensors present the correct and expected values otherwise testing may have to be repeated due to uncertainty of input data.

National guidelines and sensor suppliers recommended calibration routines should be strictly followed and documented.

Simple controls can easily be done and are strongly recommended for each occasion the equipment is applied i.e.:

- Verify pressure transducers against atmospheric pressure, normally around 101 kPa(a). The low pressure transducer should be close to this (with allowance for atmospheric and altitude variations). The higher the range of the pressure transducer is the larger deviation in kPa is within tolerance. Sensors should be well within supplier specification before it is applied (1% of full scale is recommended maximum tolerance e.g. 10 kPa deviation for a 10 Bar(g) sensor see sensor specifications). Calibrations of offset can easily be done in ClimaCheck or logger depending on system.

- Temperature sensors should be connected before that they are applied to verify that they show the same or very similar values. The accuracy will be improved if the control is done with all sensors in water that is stirred. Recommended quality specification of temperature sensors are Pt1000 class A (approximately 0.15 K tolerance see sensor specification)

- Power transducers should display zero when current clamps are disconnected from lines. When in operation power should always be checked against name plate/catalogue data to identify any bad connections or malfunctions.

Any unexpected differences should be corrected before sensors are applied.

Calibration of all sensors should be done regularly according to routines set up by the user of the equipment. Calibration is normally done with known references (ice water or boiling water) and with accurate instruments that are regularly calibrated.

7.1 Locking the case when measuring

The ClimaCheck case has a removable panel in the middle of its long edge. This allows you to keep all sensors connected and still closing the lid. If needed the case can be secured with a pad lock, making sure no one tampers with the equipment when left unattended.

8 Start and connection to ClimaCheck PA Pro

This section explains how to start the ClimaCheck PA Pro hardware and connect it to your PC.

8.1 Start

ClimaCheck PA Pro starts directly when it is connected to the power supply. After a start-up sequence of about 90 seconds, **Status** lights up and the unit is ready to be used.

When you are finished with your measurements shut down the PA Pro by disconnecting the power.

8.2 Connecting directly to a PC

ClimaCheck PA Pro is connected to your PC by its network socket.

Important
The supplied network cable is of the "crossed" type that is required for connection PA Pro to older computers. On a modern PC any network cable can be used.

8.3 Connecting to a network

In addition to a direct connection PA Pro can also be connected to an existing network. For this to work you need to change the IP address used by PA Pro to one working with the network.

- Open a web browser and enter the location **"http://169.254.1.1"**.
- Log in with **user name "config"** and **password "ef56"** (default).
- Choose **Settings** and then **Communication** in the menu to the left.
- Choose **LAN/DNS** and enter settings appropriate for the network. Ask the person responsible for the network for the correct settings.
- Click **Update**.
- Click **Restart**.

PA Pro will restart with the new settings and you will lose connection with it. To be able to connect to PA Pro you must supply the new IP address in the ClimaCheck software under **Settings** > **Preferences** > **Perf. Anlys. pro**.

Important

- Write down the new IP address. If you forget it the hardware will have to be factory reset.
- When connecting to a network you should **not** use a "crossed" cable. The supplied cable can work on newer equipment but you might have to use another cable.
- The connection process will not exactly follow the outline in section 9.2.

For more information about different ways to connect to PA Pro, please refer to the complete manual.

9 Connecting the ClimaCheck software to PA Pro

The following section describes how to start the ClimaCheck software in standard configuration and how to connect it to PA Pro.

9.1 Installing the ClimaCheck Software

When installing the ClimaCheck software make sure to follow these guidelines:

- You need to be logged in as an administrator.
- You need have a working internet connection for registration.
- Install the software at the office to minimize the risk of problems when you are at the site of measurement.
- Your license number can be found on a copy of the delivery note attached at the end of this manual.
- Select PA Pro as your logger type when starting the software for the first time.

9.2 Start and connect software to PA Pro (step by step)

The steps are:
- A. Start the PA Pro (supply power) – start-up is about 1-2 minutes until status becomes green.
- B. Plug in Ethernet cable (the socked marked with a globe and a laptop) and the network socket of your computer. Make sure Link is lit and LAN is flashing on PC contact and PA Pro.
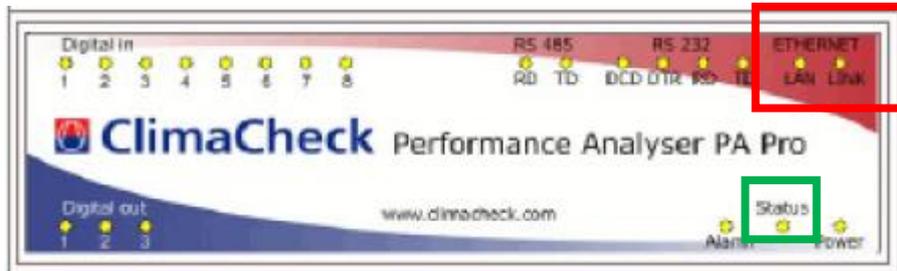

- C. Windows will then automatically establish a PC to PC network in the 169.xxx.xxx.xxx range – during this time **1- 3 minutes**) the network icon in the information bar (typically lower right corner) will show either a bouncing ball or the rotating blue symbol.

When Windows succeed in establishing a 169.xxx.xxx.xxx network it will indicate that there is a connection but it has no internet connection by displaying the warning triangle on the network symbol and you might get a message "Connection to local network: This connection got no or limited connectivity" or similar.

- D. Start Standard template
    - a. Start the software by choosing ClimaCheck Standard on the start menu
    - b. Choose network interface, look for an IP address beginning with 169.
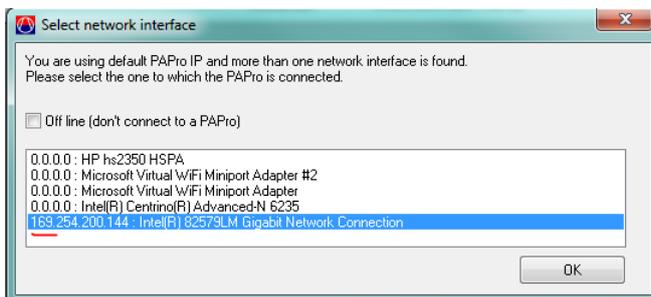
If there are problems with Windows not connecting to the PA Pro see troubleshooting, section 9.3.

- E. Reminder of refrigerant
- F. Press contact and choose Direct on menu.
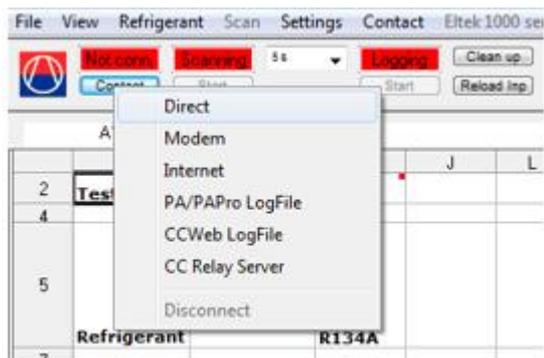
It is possible that you get the question *"The channel names in this datasource are not the same as in the connected PA Pro or in the loaded PA Pro logfile. Connect anyway?"*. This means that your logger do not currently use the exact same names for its data channels as the software does. This results from the hardware and software not being updated at the same time, or that either the hardware or the software got custom configurations. In either case, just click **Yes** to continue. You will now get the question *"Do you want to update the datasoource with the channel names from the connected PA Pro or loaded PA Pro logfile?"*. Click **Yes** here as well.

To ensure that you do not get this question on every start, you will have to save the updated datasource:

- Select **Settings** -> **Preferences** from the menu.
- Check the box **Advanced mode** and click **OK**.
- Select **File** -> **Save Datasource changes** from the menu.
- Disable advanced mode again if want to hide the extra options it enables.

9.3 Troubleshooting the connection

If you have problems getting contact with the PA Pro try the following:

- Restart the program and select another network card when you are asked.

- Make sure the correct DataSource is chosen under **Settings** > **Preferences** > **Common** > **Default DataSource**. By default you should use **PA_Pro_standard.ccd**.

- Make sure that the **Link** lamp on the PA Pro is lit. If not check that all the cables are properly connected and that you use the correct type of a network cable.

- If there are problems with Windows not connecting to the PA Pro but there are mobile or WiFi networks connected it can be necessary to disable these while PA Pro connects as in particular many Mobile operators disable the automatic Windows to Windows network start up to direct all traffic over their network. Also a few WiFi boards seem to do this. If these boards are disabled during connection of the PA Pro they can then be activated again as they would normally not disable existing connections. You will find this setting under Start > Control Panel > Network connections. Then right clicking on the name of the network adapter.

- Check that your network settings in windows is set to "Obtain an IP address automatically" under TCP/IPv4 properties.

10 Basic Functions of the Software

10.1　Tabs

The tabs contains different data and ways to display it.

- **Description** – Information about the measured system entered by the user. Not directly used by the program.
- **Report** – The standard tab containing current and previous data in a chart.
- **Constants** – Contains constants that can be modified by the user.
- **Input** – Shows the data supplied by the sensor. Convenient when troubleshooting the attachment of the sensors.
- **Custom** – Compare how the system runs before and after your adjustments. To select a reference point right-click on the row in the **Report** tab and select **Copy to CustomSheet**.
- **Flow chart** – Displays a flow chart overview of the system.
- **Graph-tabs** – Two tabs showing graphs over the systems values varying over time.

10.2　Choosing refrigerant

When starting the refrigerant will often be set to R134A automatically. To choose another refrigerant go to the menu **Refrigerant**. Always make sure the correct refrigerant is selected before starting the measurements.

10.3　Choosing measuring interval

You choose how often measurements should be retrieved by selecting a value in drop down menu to the right of **Scanning.** On site 5 seconds is usually a good value, but if you are going to leave it for a time it is often better with 60 seconds.

10.4　Starting the measurement

To start collecting data from the PA Pro click the **Start** button in the upper left corner. **Scanning** is shown against a green background and the logging starts automatically. To stop press the same button again.

10.5　Printing the results

Start by selecting the tab you want to print and then choose **File** and **Print**. Start the printing by clicking **Options**. To print the flow chart you need to choose **Print Flowchart** directly under **File**.

10.6　Exporting the results

Export your results to a file by selecting **File** and **Export**. You can choose among Excel, XML and Ascii.

10.7　Save

Save your data by selecting **File** and **Save ClimaCheck Workbook**. You can also save your changes as a new template by selecting **File** and **Save ClimaCheck Workbook as Template**.

10.8　Emptying the database

Empty the database by clicking the **Clean up** button.

11 Using extension cables for temperature sensors

When a temperature sensor is used with an extension cable an extra resistance is added. This has to be compensated for in the software.

In the ClimaCheck software, choose the **Input tab** in the Workbook and enter the **offset** of the extension cable in Kelvin (a positive value). The fields in question (depending on which cables have been extended) are marked in red below:

	B	C	D	E	F	G	H	I
1		Units						
2	Input	Enhet.						
3		MKS		Data	Offset	Gain		Raw Data
5	ClimaCheck standard Pt1000 givare med 5 och 10 m ledning har 1.3 ohm (=0.35K) resistans							
6	**External System Performance**							
14	**Evaporator Secondary**							
15	Ambient temp Cold side	°C	TT_AmbC	0.000	0.000			
16	System Secondary Cold Temp in	°C	TT_SecC_in	0.000	0.000			
21	System Secondary Cold Temp out	°C	TT_SecC_out	0.000	0.000			
30	**Condenser Secondary**							
31	Ambient temp Warm side	°C	TT_AmbW	0.000	0.000			
32	System Secondary Warm Temp in	°C	TT_SecW_in	0.000	0.000			
36	System Secondary Warm Temp out	°C	TT_SecW_out	0.000	0.000			
43	**Refrigerant Circuit**							
44	High Pressure Refrigerant	kPa(a)	PT_RHP	0.000	0.000			
46	Low Pressure Refrigerant	kPa(a)	PT_RLP	0.000	0.000			
51	Refrigerant temp Comp out (Discharge)	°C	TT_RComp_out	0.000	0.000			
57	Refrigerant Temp Condenser in	°C	TT_RCond_in		0.000			
59	Refrigerant Temp Condenser out	°C	TT_RCond_out		0.000			
61	Refrigerant Temp Expansion Device in (liquid line)	°C	TT_RExp_in	0.000	0.000			
65	Refrigerant Temp Evaporator out	°C	TT_REvap_out	0.000	0.000			
67	Refrigerant temp Compressor in (suction line)	°C	TT_RComp_in	0.000	0.000			
71	**Electrical Input Compressor**		**Power meter factor 1 = meter value. Change if only part of Amp. can be measured (doub**					
72			For PA8:7 use 1.0 for current clamps/transformers with ratio 100:1 and 10.0 for 100					
75	Electrical Power Input Compressor tot	kW	EP_Comp		0.000		1.0	
84	Energy from EP pro1	kWh	Energy_EP_pro1					
88	Voltage L1- Neutral alt. L1-L2 Comp tot	V	EV_Comp_L1	0.000	0.000			
89	Voltage L2- Neutral alt. L2-L3 Comp tot	V	EV_Comp_L2	0.000	0.000			
90	Voltage L3- Neutral alt. L3-L1 Comp tot	V	EV_Comp_L3	0.000	0.000			
92	Current L1 Compressor	A	EA_Comp_L1	0.000	0.000			
93	Current L2 Compressor	A	EA_Comp_L2	0.000	0.000			
94	Current L3 Compressor	A	EA_Comp_L3	0.000	0.000			
96	Power Factor tot		EPf_Comp	0.000	0.000			
114	**Oil System**							
125	**Extra Temperatures**							
134	Extra temperature 8	°C	TT_X8	0.000	0.000			

12 Configuration of Power Meter EP Pro

This section explains how to change the most common settings on the EP Pro. You can find more information in the complete EP Pro manual.

12.1 Configuration of electrical system

For EP Pro to report correct values it must be configured for the electric system used. The device can handle the following varieties:

- Unbalanced 3-phase with zero (default)
- Unbalanced 3-phase without zero
- Balanced 3-phase
- 2-phase
- 1-phase

The electric system settings can be set as follows:

- Put the knob in position 1 to enable programming.
- Push in the joystick for three seconds.
- Enter the password by pushing up/down. Default setting is 0.
- Push in to enter the password.
- Push right three times to the menu section "SYS".
- Push in to change the setting (PrG is displayed).
- Push left/right to toggle between electric systems:
  - 3P.n = Unbalanced 3-phase with zero
  - 3P   = Unbalanced 3-phase without zero
  - 3P.1 = Balanced 3-phase
  - 2P   = 2-phase
  - 1P   = 1-phase
- Push in to save the setting (PrG disappears).
- Push left four times to the menu section "End".
- Push in to end the programming.
- Put the knob back into position "locked".

The printed list on EP Pro detailing the information displayed by the unit is valid only for the default setting "Unbalanced 3-phase with zero". When using "Unbalanced 3-phase without zero" the following list should be referred to instead:

v   Total kWh (+) / W / W Max
v   A L1 / A L2 / A L3
v   Hours / W sys / PF sys
v   Total kWh (-) / W dmd / W dmd max

When using any of the other setting the displayed information will change in a similar way.

12.2   Configuration of CT-ratio

When delivered EP Pro is configured for a CT-ratio of 100 to fit our standard current clamp 100:1A (400 100). When used with other current clamps and transformers the CT ratio has to be adjusted as follows:

- Put the knob in position 1 to enable programming.
- Push in the joystick for three seconds.
- Enter the password by pushing up/down. Default setting is 0.
- Push in to enter the password.
- Push right five times to the menu section "Ct rAtio".
- Push in to change the setting (PrG is displayed).
- Push right/left to toggle between different size ranges for the CT-ratio and up/down to set the exact value. A small "k" to the left of the value denotes a multiplier of 1000.
- Push in to save the setting (PrG disappears).
- Push left six times to the menu section "End".
- Push in to end the programming.
- Put the knob back into position "locked".

CT-ratios for Climacheck standard current clamps are:

Current clamp	CT-ratio
100:1A (400100)	100
250:5A (400112)	50
500:5A (400112)	100
1000:5A (400112)	200

12.3   Resetting energy count

EP Pro records and reports measured energy. This value will continue to increase with each use of the meter. If you want to reset this value back to zero, follow the steps below:

- Put the knob in position 1 to enable programming.
- Push in the joystick for three seconds.
- Enter the password by pushing up/down. Default setting is 0.
- Push in to enter the password.
- Push left twice to the menu section "EnE trES".
- Push in to change the setting (PrG is displayed).
- Push up to change the value from "no" to YES".
- Push in to confirm the reset (PrG disappears).
- Push right once to the menu section "End".
- Push in to end the programming.
- Put the knob back into position "locked".

12.4   Using more than one Power Meter EP Pro with ClimaCheck PA Pro

When using more than one power meter EP Pro with a ClimaCheck PA Pro, both the EP Pro and the PA Pro needs to be configured. In order to use the extra information collected from a second EP Pro in the ClimaCheck software you need a special template that can be acquired from ClimaCheck or one of our distributors.

12.4.1   Configuration of EP Pro as a second power meter

By default the EP Pro is configured as power meter 1 in the system (Address 1). To configure it as power meter 2 follow the instructions below:

- Put the knob in position 1 to enable programming.
- Push in the joystick for three seconds.
- Enter the password by pushing up/down. Default setting is 0.
- Push in to enter the password.
- Push left three times to the menu section "AddrESS".
- Push in to change the setting (PrG is displayed).
- Push up to change address to 2.
- Push in to save the setting. The display will show "bAudrAtE".
- Push up and then right twice to the menu section "End".
- Push in to end the programming.
- Put the knob back into position "locked".

12.4.2   Configuration of PA Pro for a second power meter

The PA Pro is pre-configured for an extra EP Pro unit, but by default it is not activated. To activate it follow the instructions below. If your default settings do not mirror what is described you might have an old default configuration. Contact ClimaCheck or one of our distributors to receive an update.

- Connect the PA Pro to your computer as described in section 9.2.
- Open a web browser and enter **http://169.254.1.1**
- The default user name is **"config"** and password **"ef56"** (default).
- Select **Settings** -> **Advanced** - > **External Units**.
- Select unit **2 EP_Pro2**.
- Check **Activate** and click **OK**.
- Select unit **2 EP_Pro2** again.
- Set Read Current, Read Energy, Read Power sum and Read P.Factor to **10 seconds.**

- Click **OK**.
- Select **Settings** -> **Advanced** -> **Channels**.
- Scroll down to channel 130 and **check the boxes** to the right of the channels **130-132** and **136-138**. Check that the channel names correspond to the image below.

- Click **Save**.
- Select **Settings** -> **Advanced** -> **Databases.**
- The following **channel names** should have been added to your **database items** list:

```
32                              EP_Comp2_EP_Pro2
33                              pF_Comp2_EP_Pro2
34                              Energy_Comp2_EP_Pro2
35                              EA_Comp2_L1_EP_Pro2
36                              EA_Comp2_L2_EP_Pro2
37                              EA_Comp2_L3_EP_Pro2
```

- The configuration is complete. Close the web browser.

13 Configuration of Power Meter EP Pro Scout

This section explains how to change the most common settings on the EP Pro Scout.

13.1   Electrical system diagrams

The EP Pro Scout can be used to measure the following electrical systems
- 3-phase with zero
- 3-phase without zero
- 2-phase
- 1-phase

The current transformers and the voltage cables should be connected according to the electrical system diagrams below.

3-phase with zero
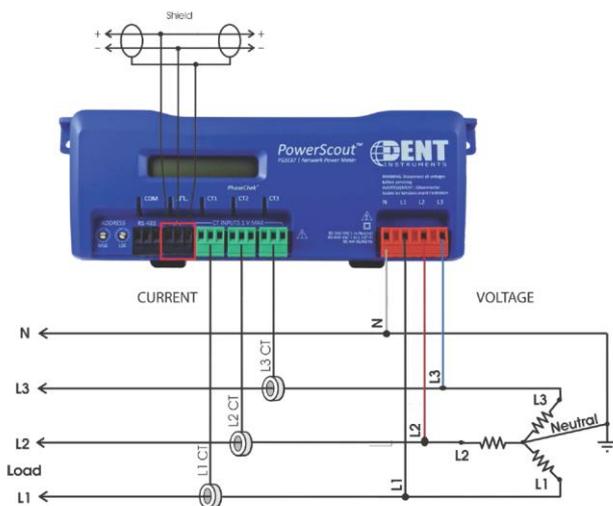
3-phase without zero
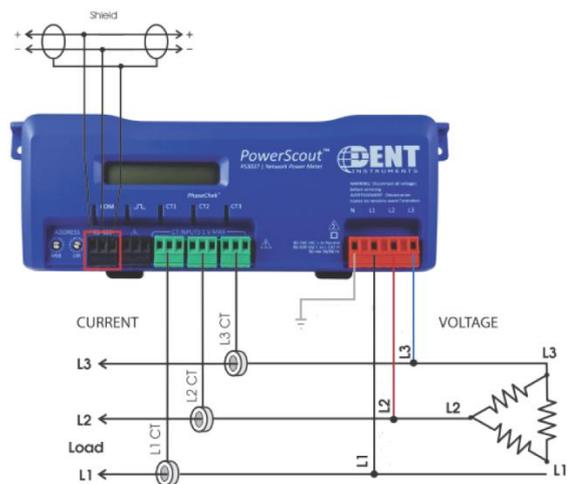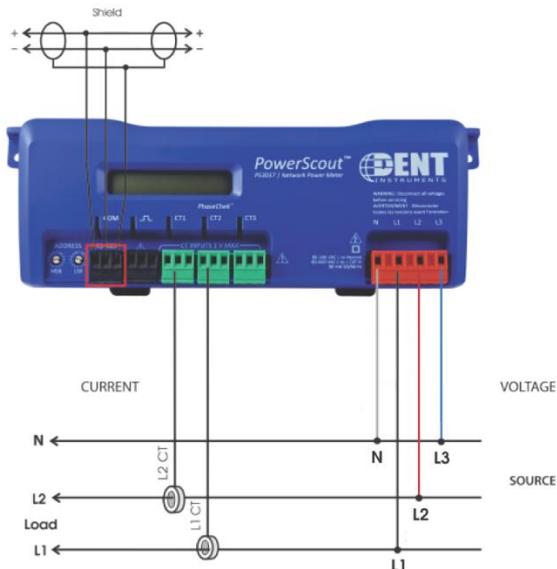
2-phase

1-phase
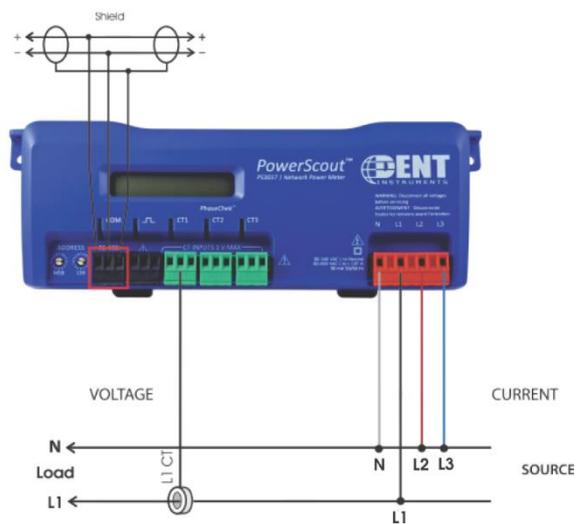
13.2　Configuration of CT type

The EP Pro Scout can be used together with 150A current clamps and Rogowski coils. In order to change the CT type, the power meter should be accordingly configured as follows:

- Install the ViewPoint software found on the USB memory.
- Connect the EP Pro Scout to the computer via the provided USB cable.
- Launch the ViewPoint software.
- Select the correct PC COM Port which states "DENT USB"
- Click on the "Connect" button. The model number and the firmware version of the EP Pro Scout will be shown.
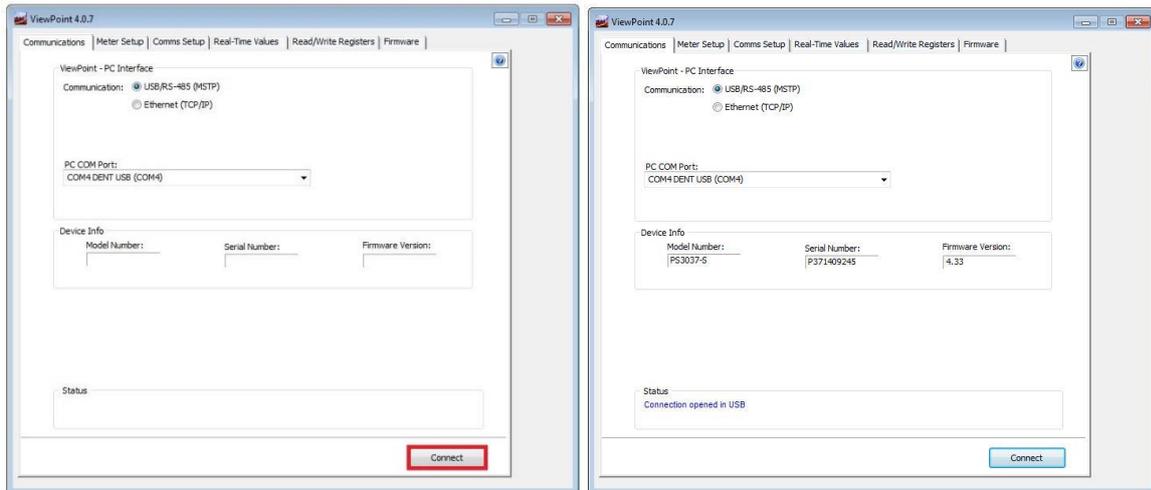
- Move to the "Meter Setup" page and click on "Retrieve Meter Setup".
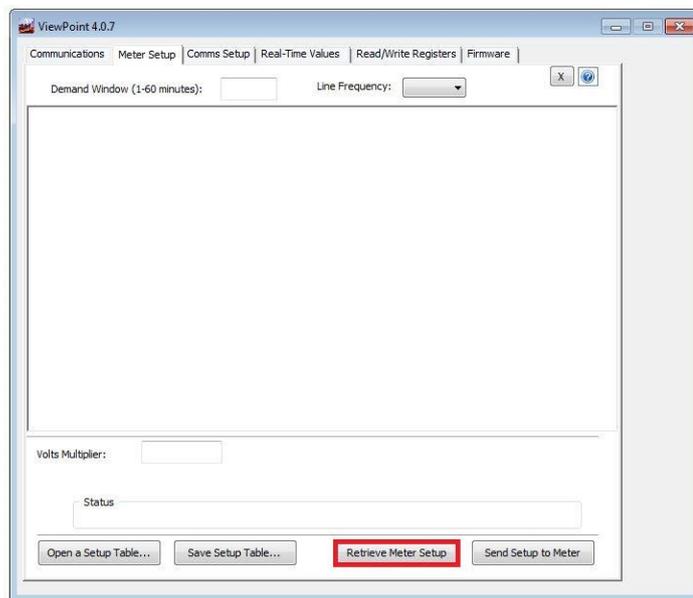
- Adjust the line frequency if required. Americas and parts of Asia use a frequency of 60Hz.
- Adjust the CT type: "RoCoil" for Rogoswki coils and "Millivolt CT" for current clamps. For the 150A current clamps provided, the "CT Amps" should be set to 150 and "CT Phase Shift" to 1.1, as shown in the figures below. For the 20A split cores, the "CT Amps" should be set to 20 and "CT Phase Shift" to 0.75.

- Click on "Send Setup to Meter" when finished.
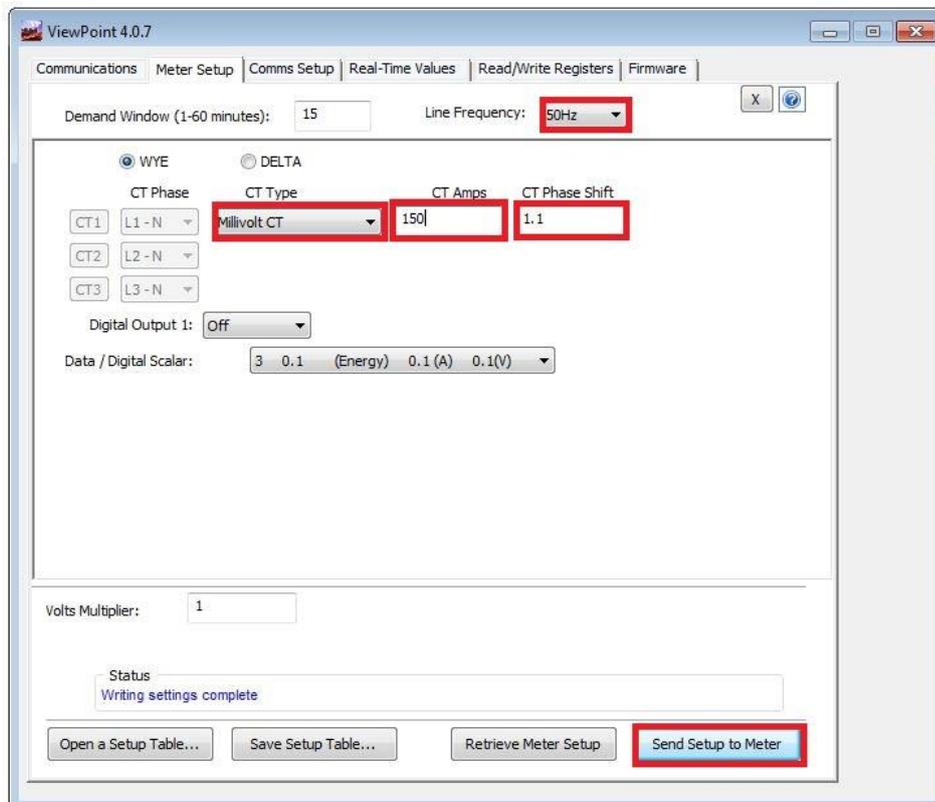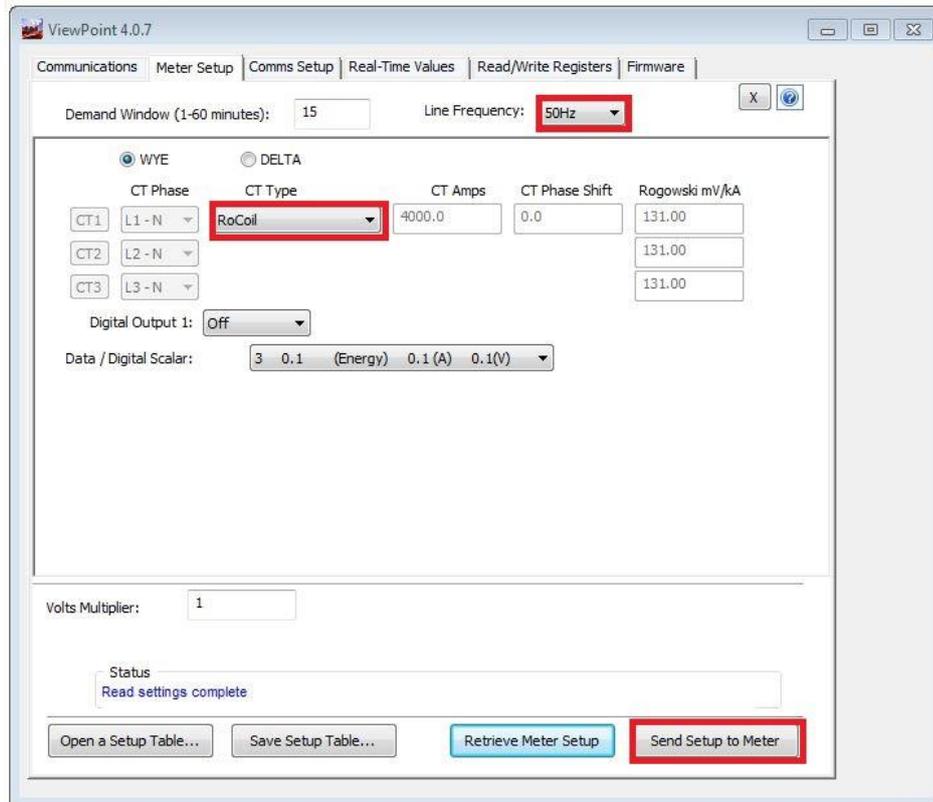
13.3 Resetting energy count

EP Pro Scout records and reports measured energy. This value will continue to increase with each use of the meter. If you want to reset this value back to zero, follow the steps below:

- Install the ViewPoint software found on the USB memory.
- Connect the EP Pro Scout to the computer via the provided USB cable.
- Launch the ViewPoint software.
- Click on the "Connect" button.
- Move to the "Read/Write Registers" tab and click on "Clear Totals" as shown below.
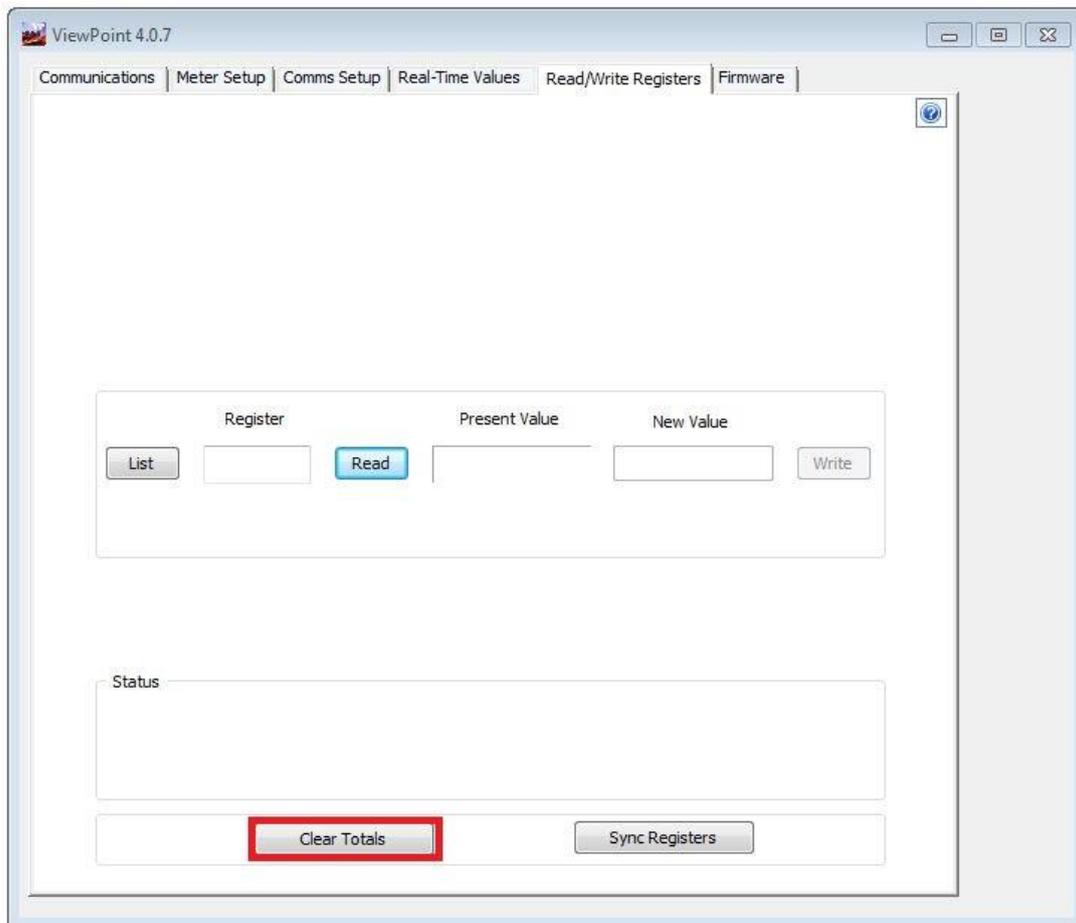
13.4 Using more than one Power Meter EP Pro with ClimaCheck PA Pro

When using more than one power meter EP Pro with a ClimaCheck PA Pro, both the EP Pro and the PA Pro needs to be configured. In order to use the extra information collected from a second EP Pro in the ClimaCheck software you need a special template that can be acquired from ClimaCheck or one of our distributors.

13.4.1 Configuration of EP Pro as a second power meter

By default the EP Pro Scout is configured as power meter 1 in the system (Address 1). To configure it as power meter 2, the address should be changed to 2. There are two rotary switches on the power meter, labelled MSB and LSB. These two switches are used to select the address used for communication.

The rotary switches are 16-position, hexadecimal switches. The address is a hexadecimal (hex) value, represented by the digits 0 through 9 and letters A through F.

To configure the address to 2, set the MSB switch to 0 and the LSB switch to 2.

13.4.2 Configuration of PA Pro for a second power meter

The PA Pro is pre-configured for an extra EP Pro unit, but by default it is not activated. To activate it follow the instructions below. If your default settings do not mirror what is described you might have an old default configuration. Contact ClimaCheck or one of our distributors to receive an update.

- Connect the PA Pro to your computer as described in section 9.2.
- Open a web browser and enter **http://169.254.1.1**
- The default user name is **"config"** and password **"ef56"** (default).
- Select **Settings** -> **Advanced** - > **External Units**.
- Select unit **2 EP_Pro2**.
- Check **Activate** and click **OK**.
- Select unit **2 EP_Pro2** again.
- Set Read Current, Read Power, Read Total Ener, Read Power sum and Read P.Factor to **10 seconds.**

- Click **OK**.
- Select **Settings** -> **Advanced** -> **Channels**.
- Scroll down to channel 130 and **check the boxes** to the right of the channels **130-132** and **136-138**. Check that the channel names correspond to the image below.

- Click **Save**.
- Select **Settings** -> **Advanced** -> **Databases.**

- The following **channel names** should have been added to your **database items** list:

32	EP_Comp2_EP_Pro2
33	pF_Comp2_EP_Pro2
34	Energy_Comp2_EP_Pro2
35	EA_Comp2_L1_EP_Pro2
36	EA_Comp2_L2_EP_Pro2
37	EA_Comp2_L3_EP_Pro2

- The configuration is complete. Close the web browser.

14 Restoring the default configuration or installing an updated default configuration

If you have made changes to the PA Pro configuration that causes problems it may be useful to restore the default configuration. The files needed can be found on the USB memory that came with your system in the **Default_Configuration_(date)** folder. If you got an older version that does not have this folder, please contact ClimaCheck.

New default configurations are occasionally released for PA Pro customers with a Service Agreement, correcting bugs and enabling new features.

To upload a default configuration to your PA Pro follow the instructions below:

- Make sure to take note of all changes to the default configuration that you want to save, as these will have to be remade after installing the package. This includes all settings for a wireless modem, as APN and UDP ID. Settings on the ClimaCheck PC software will not be affected.

- Connect the PA Pro to your computer as described in section 9.2.

- Open a web browser and enter **http://169.254.1.1**

- The default user name is **"config"** and password **"ef56"**.

- Select **Settings** -> **System** -> **File Manager**.

- Click the **Erase** button under the **APPLICATION INIT** section.

- Wait a couple of minutes for the PA Pro to restart.

- Click **System** in the menu again to reload the page.

- Click the **Upload Bundle** button, navigate to the **Default_Configuration_(date)** folder and select the **Default_Configuration_(date).bundle** file.

- Wait for the installation to finish. This will take some time and the PA Pro will restart several times, breaking the network connection. The process is finished when the status box turns green and gives you a notification. Do not assume the update has failed unless you have left it to process for **at least 20 minutes**.

- If the updating process would for some reason fail, just start over from the beginning.

15 Standard content of the PA Pro case

Product	Amount	
PA Pro (mounted in case)	**1**	
Power supply 24 VDC	**1**	
Network cable (crossed)	**1**	
Short serial cable	**1**	
Long serial cable	**1**	
Temperature sensors	**8**	
Pressure sensors 10 bar	**1**	
Pressure sensors 35 bar	**1**	
Cables for pressure sens.	**2**	
EP Pro (Power Meter)	**1**	
Voltage cable	**4**	
Voltage clamp	**4**	
Current clamp/Rogowski	**3**	
Heat transfer paste	**1**	
Aluminium tape	**1**	
Insulation tape	**1**	
Extra fuses 1 A	**10**	