

**Commissioning Instruction**  
***For Cab HVAC System of***  
**Amsterdam Metro**

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**Amsterdam metro  
Cab HVAC System  
Commissioning Instruction**

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**Release History**

	<b>name</b>	<b>Department</b>	<b>Date</b>	<b>Signature</b>
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**Distribution list**

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## 1 General

The purpose of this document is to test following system functions:

- Hardware -software connection
- Connection between microcomputer (FPC08) and system components (car wiring)

FAIVELEY shall commission all trains with the new air conditioning to ensure the readiness of the trains to enter service.

### 1.1 Introduction

Safety instruction:

Operation, maintenance and repair work on the equipment are to be carried out **solely** by **competent qualified personnel**.

Valid **standards and safety specifications** are to be observed!

#### *Caution*

The service program may only be operated by skilled and instructed personnel as the system's safety devices are off in the SERVICE MODE and operating errors may damage components or the system as a whole.

### 1.2 Procedure

AC systems incorporate climate controllers (FPC08) and require component tests for proper startup using a laptop/PC on which a specific service program (monitor) for maintenance and commissioning has been installed. The program interacts with the computer via a USB interface.

In the service mode, outputs are switched on without activating any safety devices.

Be sure to observe the test sequence to avoid damage to the system.

Only the safety chain of the compressor and of the fans in the AC-unit is working.  
Please follow the instruction to be sure, that all conditions concerning safety are met.

Generally:

- Set “service mode” button to false in service mode of PC to switch OFF all outputs at the same second, if there is a risk of danger arising.

## 1.3 Preparations


Wiring to FPC08 and to conditioners is in place and has been tested.  
The refrigerant circuit has been charged with specified refrigerant R407C.  
The procedure takes into account one HVAC unit together with one controller.

## 1.4 Tools

Technical preconditions and tools are:

- Multi-meter (needed range of current):
  - Current 0.1A to 50A AC, 0.1A to 20A DC
  - Voltage 0.1V to 500V AC, 0.1V to 150V DC
- Clamp meter (optional, make current measurement more comfortable)
  - Current 0.1A to 50A AC, 0.1A to 20A DC
- Rotary field measurers 500V AC 3Phase 50Hz
- PC (LAPTOP) with ready to install maintenance software Mona (please refer to Mona customer handbook) in minimal Configuration:
  - Pentium 200MHz or equal, 32MB RAM
  - Display 256 colors, 800x600
  - USB port (Ver1.1 or higher)
  - CD-ROM drive (for installation)
  - Windows 98 (second edition) or higher (NT 4.0,2000, XP)
  - Internet explorer 5.5 or higher
  - External mouse (optional)
- Maintenance software “MonA”
- USB Cable (both end are male plug) If more than 2M you need USB extension cable.



- FPC08 Operating Software Version E1.0
  - $\mu$ P Operating System (OS332)  
Filename: \_332\_update.bat
  - DSP Operating System (OSdsp)  
Filename: \_tms\_update.bat
- Application Software:
  - AS version (Application software) direct download  
Filename: down\_appl.bat
  - AS version (Application software) download with MonA:  Download
    - KS97C.s19 file (application software, check for last issue)
    - Appli.tst file (belonging to application software)
    - KS97C.mpf file (project file of service software, check for last issue)
- Electrical interface document: KS97C-EID\_ELECTRICAL\_INTERFACE
- Electric schematic :KS97C 000-00A.S4
- Software specification: KS97C\_SRS\_02

## 1.5 Preconditions for commissioning

step		Precondition	Required document	OK
1.	<b>400V AC = OFF !!!</b>	All components of the air conditioning system, including duct system must be completely installed. Electrical connections e.g. finally CAN-bus connection and grounding must be installed.		<input type="checkbox"/>
2.		The HVAC unit was tested successful	test report available and successful finished	<input type="checkbox"/>
3.		The insulation check of car wiring was tested successful	test report available and successful finished	<input type="checkbox"/>
4.		The electrical system supply must be available (110V DC, 3x400VAC)	Commissioning report available and successfully finished	<input type="checkbox"/>
5.		The CAN-bus is working properly	test report available and successful finished	<input type="checkbox"/>
6.	<b>400V AC = OFF !!!</b>	The components of the air conditioning system must be accessible. This applies also to the accessibility of the HVAC unit on top of the car.		<input type="checkbox"/>
7.		Mounting points on the car body through twelve M10 bolts have been correctly done		<input type="checkbox"/>
8.		Flexible ducts connecting the blower outlets with the main air duct. Each flexible duct is mounted through four M8 bolts.		<input type="checkbox"/>
9.		Maintenance covers of the unit can be opened and also switchboxes (access to electrical devices and terminals)	The covers can be opened only when the HVAC unit is powered off.	<input type="checkbox"/>
10.		Ambient temperature of the car is at least 10°C. (If the ambient temperature is below 10 degrees, Require refrigeration professional guidance).		<input type="checkbox"/>

## 2 Visual check

For visual check, all supply voltage should be switched OFF (3x400V AC, 110V DC).

### 2.1 Visual check of mechanical components *(If impossible to do then skip this step)*

step		Location / device	Activity	OK
11.	<b>400V AC = OFF !!!</b>	HVAC unit	Unit well mounted, safety parts OK (no visible damages)	<input type="checkbox"/>
12.			Check for free roof drainage	<input type="checkbox"/>
13.		Compressors	Compressors are well mounted	<input type="checkbox"/>
14.		Condenser fans	Free run possible, check arrow direction	<input type="checkbox"/>
15.		Supply fans	Free run possible, check arrow direction	<input type="checkbox"/>
16.		Generally	Check for fixation of all parts. Look for lost tools or forgotten material from production.	<input type="checkbox"/>

## 2.2 Visual check of electrical components *(If impossible to do then skip this step)*

step		Location / device	Activity	OK
17.	<b>400V AC =OFF !!!</b>	HVAC unit	Plugs of HVAC unit are connected	<input type="checkbox"/>
18.			Earth connection of HVAC unit (check roof of the unit)	<input type="checkbox"/>
19.		Control panel interface in the car	400VAC power supply from electrical system of car is available, terminals: -X05: A1,A2, A3;  And 400VAC is switched off.	<input type="checkbox"/>
20.			Earth connection of control panel HVAC unit are connected	<input type="checkbox"/>
21.		Controller FPC08 plugs and earth connection	Plug of controller FPC08 are connected (-P1,-P2, -P3, -P5,)	<input type="checkbox"/>
22.			Earth connection of controller is connected.	<input type="checkbox"/>
23.		I/Os and earth connections for the inverter.	Are connected correctly.	<input type="checkbox"/>
24.		Return air temperature sensor	Return air sensor is connected	<input type="checkbox"/>
25.	Supply air temperature sensor	Supply air sensor is connected	<input type="checkbox"/>	
26.		One electrical connector for the recirculated air damper located on the recirculated air grill is connected	<input type="checkbox"/>	

## 2.3 Adjustment of electric components

step		Component / part	Activity	OK
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27.	<b>400V AC = OFF !!!</b>	Circuit breakers	Adjustment of current:  QF1 = 5.9A    QF2 = 1.6A FR1 = 1.2A FR2 = 1A Adjustment of time relay KT1 = 5s	<input type="checkbox"/>
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### 3 Instruction

Step		Activity	Response / PC-display	OK
28.	<b>400V AC = OFF!!!</b>	Requirements: Supply voltage for FPC08 (110V DC) is available Switch off the circuit breaker QF1 ~ QF7		<input type="checkbox"/>
29.		<b>Preconditions</b> - 400V AC available on car, check the 3~ sequence at the power supply plug of HVAC unit then <b>switched OFF</b> - 110V DC available on car, at the power supply plug of HVAC unit then <b>switched OFF</b> - Laptop connected USB port.	<b>Direction: right rotary field.</b>  <b>400V AC is OFF.</b>  <b>110V DC is ON.</b>	<input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>
30.	<b>400V</b>	Switch QF7 <b>ON</b>		<input type="checkbox"/>
31.		Check power: LED of FPC08	If 110V DC supply for the FPC08 module available, and software ready loaded	<input type="checkbox"/>

### 3.1 Checking software versions and Setting the Real Time Clock

Step		Activity	Response / PC-display	OK
32.	<b>110V DC = ON!!!</b>	Requirements: Supply voltage for the FPC08 (110 VDC) is available		<input type="checkbox"/>
		<b>USB and PC (COM1) is OK</b>		
33.		How to find actual software?	Please refer to Version Description Document ( <b>KS97C_VDD</b> ), last valid issue, to find at basket of software and quality documents	<input type="checkbox"/>
34.		Check if MonA is ready installed on PC / Notebook	Please refer to "Mona customer handbook", to find at basket of software and quality documents	<input type="checkbox"/>

35.	<p>Check software status – start <b>MonA.exe</b> (version 2.3.0.0)</p> <p>Choose project file “KS97C_01.mpf”</p> <p>Push “√” (OK)</p> <p>Start “<b>System Information</b>”</p>	<p>Version strings for FPC08 software are read out</p> <p>Application Software</p> <ul style="list-style-type: none"> <li>- HFG Name: <b>KS97C</b></li> <li>- Version: e.g. <b>0.1</b> (has to correspond to version enabled at the time)</li> <li>- Date: e.g. <b>2011-06-15</b></li> </ul> <p><b>μP332 Operating System</b></p> <ul style="list-style-type: none"> <li>- &lt;F&gt; Number: <b>535996</b></li> <li>- Version: e.g. <b>4.2</b> (has to be correspond to version enabled at the time)</li> <li>- Date: <b>01.02.05</b></li> </ul> <p><b>DSP Operating System</b></p> <ul style="list-style-type: none"> <li>- &lt;F&gt; Number: <b>532230</b></li> <li>- Version: e.g. <b>3.01</b> (has to be correspond to version enabled at the time)</li> </ul> <p><b>Remark:</b></p> <p><b>OS 4.2 is included</b></p> <ul style="list-style-type: none"> <li>- <b>μP332 (4.2) and DSP (4.2)</b></li> </ul>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
36.	<p>If application software loaded (version) does not correspond to status enabled or you read “Bad Symbols” in the left lower corner, leave „<b>System Information</b>” and update application software by calling up „<b>Download</b>”.</p>	<p>New application software is loaded into controller.</p>	<p><input type="checkbox"/></p>
37.	<p>If download process was successful (status: active)</p>	<p>Successful connection</p>	<p><input type="checkbox"/></p>
38.	<p>How to find actual Operating System (OS) software?</p>	<p>Please refer to Version Description Document (KS97C_VDD), last valid issue, to find at basket of software quality documents</p>	<p><input type="checkbox"/></p>

110V DC = ON!!!

39.	110V DC = ON !!!	<p>If system software loaded (<math>\mu</math>P Operating System Version) does not correspond to status enabled, leave „<b>MonA</b>“.</p> <p>Update download of system software (<math>\mu</math>P Operating System Version) by calling up „<b>_332_update.BAT</b>“.</p>	<p>New system software (<math>\mu</math>P Operating System Version) is loaded into controller.</p> <p>Attention!</p> <p>When the download does not start, then do not stop the download and switch off and on the controller. After this the download should running.</p>	<input type="checkbox"/>
40.	110V DC = ON !!!	<p>Update download of system software (SystemTMSVER) by calling up „<b>_tms_update.BAT</b>“.</p> <p>Important: Check for hardware issue of “FPC08 A,B,C” or “D FPC08”</p> <p>(Standard is defined D FPC08)</p>	<p>New system software (DSP Operating System Version) is loaded into controller.</p> <p>Attention!</p> <p>When the download does not start, then do not stop the download and switch off and on the controller. After this the download should running.</p> <p>Select right DSP software!</p>	<input type="checkbox"/>  <input type="checkbox"/>
41.	110V DC = ON !!!	<p>Set the Real Time Clock from the controller (Base: PC / Laptop)</p> <ul style="list-style-type: none"> <li>- Start “Real Time Clock Control”</li> <li>- Compare date and time of the controller with the real date and time</li> </ul> <p>In case of a difference write the real date and time in the first line under “jj/mm/aa hh:mm:ss” or push the button situated right from the “PC system time”, if you sure that this date and time is correct. <b>compare Figure 3-2</b></p>	<p>Controller time for FPC08 are read out</p> <ul style="list-style-type: none"> <li>- under “jj/mm/aa hh:mm:ss” you read the actual controller real time clock</li> </ul> <p>after few seconds later you read the new actual controller real time clock under “jj/mm/aa hh:mm:ss”</p>	<input type="checkbox"/>  <input type="checkbox"/>
42.		<p>Check if CAN-BUS interface cable between controller FPC08 (<b>P5</b>) and TCMS is OK</p>	<p>Both FPC08 and TCMS can see each other.</p>	<input type="checkbox"/>

### Overview of system and application softwares

Application Software		Hardware	
HFG Name :	ks97c	Type :	FPC08
Version :	0.20	S\N :	1458
Date :	2011-6-15	P\N :	536898
		Reset Counter :	2133
µP Operating System		Configuration	
<F> Number :	535996	Id number :	1
Version :	4.20	Version :	1.00
Date :	2005-2-1	Date/time :	2010-5-10 0:12:00
Checksum :	33E7		
DSP Operating System		Test Mode & Service Mode	
<F> Number :	532230	Status :	Running
Version :	4.23		







Figure 3-1 Overview of system and application software

### Internal date / time update


Settings

jj/mm/aa hh:mm:ss




OR

Seconds elapsed since 01-01-1970



OR

PC system time



**RTC Status :**
Ok






Figure 3-2 Real Time Clock Control

## 3.2 Checking system overview



Figure 3-3 IBS view

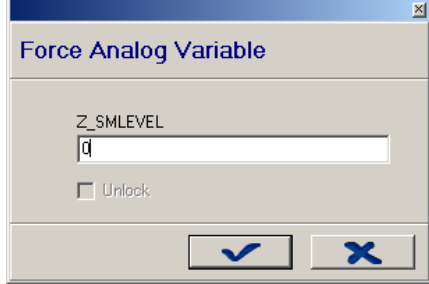
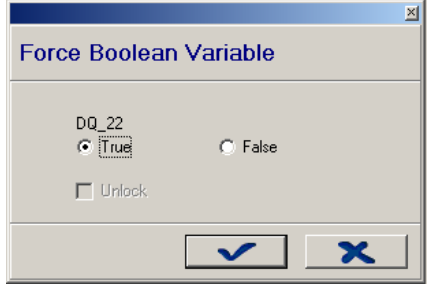
## 3.3 Checking analog inputs

step	Activity	Response / PC-display	OK
43.	<b>Check of analogue inputs:</b>  Start Mona software and open <b>Mona – IBS view</b> (compare Figure 3-3 IBS view)	Compare display value with expected value (see table below) modify temperature (cooling spray) and ask again  The result can be different, but the tendency shall be clear	<input type="checkbox"/>
44.	<b>AI_01_SAS (Supply air temperature sensor)</b> - Check temperature	The result shall be real duct temperature value. For example 20°C	<input type="checkbox"/>

step	Activity	Response / PC-display	OK
45.	<b>AI_02_RAS (Return air temperature sensor)</b> - Check temperature	The result shall be real inside temperature value. For example 20°C	<input type="checkbox"/>
46.	<b>AI_03 power detector</b>  <b>400V ON, 250V OFF</b>  <b>400V OFF, 250V ON</b>  <b>400V OFF, 250V OFF</b>	Should be:  AI_03 > 100°C  AI_03 = 8±2°C  AI_03 < -20°C	<input type="checkbox"/>
47.	<b>AI_04 temperature selection switch SA1 input</b> - Switch SA1 to '-2°C' - Switch SA1 to '-1°C' - Switch SA1 to '0°C' - Switch SA1 to '1°C' - Switch SA1 to '2°C' - Switch SA1 to '3°C' - Switch SA1 to '4°C'	Should be:  AI_04 = 3.8±1°C  AI_04 = 8±2°C  AI_04 = 12±2°C  AI_04 = 17±2°C  AI_04 = 25±2°C  AI_04 = 37±2°C  AI_04 = 66±2°C	<input type="checkbox"/>
48.	<b>AI_05 mode and SAF1 fan speed switch SA2 input</b> - Switch SA2 to 'Low Ventilation' - Switch SA2 to 'High Ventilation' - Switch SA2 to 'OFF'	Should be:  AI_05 = 47±2°C, KM8 ON  AI_05 = 66±2°C, KM7 ON  AI_05 > 100°C	<input type="checkbox"/>

step	Activity	Response / PC-display	OK
49.	<b>AI_06 mode and SAF2 fan speed switch SA3 input</b> <ul style="list-style-type: none"> <li>- Switch SA3 to 'Low Ventilation'</li> <li>- Switch SA3 to 'High Ventilation'</li> <li>- Switch SA3 to 'Emergency heating'</li> <li>- Switch SA3 to 'OFF'</li> </ul>	Should be:  AI_06 = 37±2°C, KM11 ON  AI_06 = 47±2°C, KM10 ON  AI_06 = 66±2°C, KA1, KM5 and KM11 ON  AI_06 > 100°C	<input type="checkbox"/>

### 3.4 Checking logical outputs and inputs

Step	activity	Response / PC-display	OK
50.	<b>Check of relay outputs: (ATTENTION! all logical safety functions are inis ON during service mode!). Open IBS view and set "OP level"=0 at first.</b>		<input type="checkbox"/>
51.	<b>Double click the Lamp of digital output to force digital output at anytime necessary.</b>		<input type="checkbox"/>
52.	Check for status of each follow device: QF1 ~ QF7, FR1, FR2	Only if all contactors are switched <b>ON</b> , realize next step.	<input type="checkbox"/>
53.	<b>Switch OFF 400V AC main power (disconnect plug X01)</b>	<b>400V AC = OFF</b>	<input type="checkbox"/>
54.	<b>DQ_03_SAF1 (Supply air fan 1 control)</b> <ul style="list-style-type: none"> <li>- Switch on QF3</li> <li>- Switch SA2 to 'High ventilation'</li> <li>- Simulate signal by feeding <b>DQ_03_SAF1 =1L</b></li> <li>- Check input (Mona)</li> <li>- <b>DI_03_SAF1</b></li> <li>- Switch off QF3</li> <li>- Switch on QF3</li> </ul>	Feedback <b>DI_03_SAF1 =1L</b> ,  Feedback <b>DI_03_SAF1 =0L</b> , Feedback <b>DI_03_SAF1 =1L</b> ,	<input type="checkbox"/>  <input type="checkbox"/> <input type="checkbox"/>



Step		activity	Response / PC-display	OK
59.	<b>400V AC = OFF !!!</b>	<b>DQ_01_SAF2 (Supply air fan 2 control)</b> - Switch SA3 to 'High ventilation' - Simulate signal by feeding <b>DQ_01_SAF2 =1L</b> - Check input (Mona) <b>DI_05_SAF2</b> - Switch <b>off</b> QF6 - Switch <b>on</b> QF6	Feedback <b>DI_05_SAF2 =1L</b> ,  Feedback <b>DI_05_SAF2 =0</b> Feedback <b>DI_05_SAF2 =1L</b>	<input type="checkbox"/>   <input type="checkbox"/> <input type="checkbox"/>
60.		<b>DQ_05_UH2 (Unit heater 2 control)</b> - Switch QF5 ON - Simulate signal by feeding <b>DQ_05_UH2 =1L</b> - Check input (Mona) <b>DI_04_UH2</b> - Switch QF5 OFF - Switch QF5 ON - Simulate signal by feeding <b>DQ_05_UH2 =0L</b>	Feedback <b>DI_04_UH2 =1L</b> Feedback <b>DI_04_UH2 =0</b> Feedback <b>DI_04_UH2 =1L</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
61.		- Switch SA3 to 'Low ventilation' - Simulate signal by feeding <b>DQ_01_SAF2 =1L</b> - Check input (Mona) <b>DI_05_SAF2</b> - Switch <b>off</b> QF6 - Switch <b>on</b> QF6	Feedback <b>DI_05_SAF2 =1L</b> Feedback <b>DI_05_SAF2 =0</b> Feedback <b>DI_05_SAF2 =1L</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
62.		<b>DQ_06_Y1 (Liquid line solenoid valve Y1 control)</b> - Simulate signal by feeding <b>DQ_06_Y1 =1L</b> - Simulate signal by feeding <b>DQ_06_Y1 =0L</b>	Check activity of solenoid Y1 by ear	<input type="checkbox"/>
63.		<b>DQ_07_Y2 (Hot gas bypass solenoid valve Y2 control )</b> - Simulate signal by feeding <b>DQ_07_Y2 =1L</b> - Simulate switch off signal by feeding <b>DQ_07_Y2=0L</b>	Check activity of solenoid Y2 by ear	<input type="checkbox"/>
64.		<b>DQ_08_FPCOK</b>	Check on MONA - <b>DQ_08_FPCOK =1L</b> Always ON if FPC08 is OK	<input type="checkbox"/>

### 3.5 Checking system functions

**List of all available tests**

Test mode	Command	Status
TESTMODE	0	Ended
TM_SAF1	0	Ended
TM_SAF2	0	Ended
TM_CPR_CDF	0	Ended
TM_UH1cab	0	Ended
TM_UH2aerotherm	0	Ended
TM_Y1	0	Ended
TM_Y2	0	Ended

Description of the selected test

Activation of Mona test mode - [CRLF][CRLF]This is a precondition to start the follow test routines.

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Figure 3-4 “Test mode list” interface

step	Activity	Response / PC-display	OK
65.	Open IBS view and set "OP level"=9 at first.		<input type="checkbox"/>
66.	Switch on 400V AC three-phase network	<b>400V AC = ON!!!</b>	<input type="checkbox"/>
67.	Go to <b>Maintenance</b> in the main menu  Select " <b>Test Modes List</b> "	A new windows opened and all Test mode displayed Reading: for all Test mode  <b>Command: FALSE OR 0L</b>  <b>Status: ENDED</b>	<input type="checkbox"/>
68.	Set controller to test mode - Mark the signal <b>Release TESTMODE</b>  - Push the red arrow button	All set outputs switch off Reading: <b>START TESTMODE</b> Command: FALSE OR 0L Status: ENDED Reading: <b>START TESTMODE</b>	<input type="checkbox"/>
		Command: TRUE OR 1L Status: RUNNING	<input type="checkbox"/>
69.	Start supply fan 1 high speed <b>Ventilation</b> test mode - Switch SA2 to 'High ventilation' - Mark the signal <b>TM_SAF1</b> - Push the red arrow button  Check input	Reading: <b>TM_SAF1</b> Command: FALSE OR 0L Status: ENDED	<input type="checkbox"/>
		Supply fan 1 high speed running Reading: <b>TM_SAF1</b> Command: TRUE OR 1L Status: RUNNING	<input type="checkbox"/>
		<b>DI_03_SAF1 =1L</b>	<input type="checkbox"/>
70.	- Check sense of rotation on motor <b>supply air fan 1</b>  - Measure current consumption using current probe  -	Sense of rotation acc. to arrow on motor  KM7 L1 = __ , _ A  Current: 0.9A ~ 1.1A	<input type="checkbox"/>



step	Activity	Response / PC-display	OK
75.	<ul style="list-style-type: none"> <li>- Check sense of rotation on motor <b>supply air fan 1</b></li> <li>- Measure current consumption using current probe</li> <li>-</li> </ul>	<p>Sense of rotation acc. to arrow on motor</p> <p>KM8 L1 = __ , _ A</p> <p>Current: 0.6A ~ 0.9A</p>	<input type="checkbox"/>
76.	<p><b>Start unit heater 1 testing</b></p> <ul style="list-style-type: none"> <li>- Set “<b>TM_UH1</b>” to TRUE</li> <li>- Check AI_01_SAS DI_02_UH1</li> <li>- Measure the current</li> </ul>	<p>Read: <b>TM_UH1</b> Command: true or 1L Status: running, KM18 ON</p> <p>AI_01_SAS goes up. DI_02_UH1 =1L.</p> <p>KM4 L1 = __ , _ A KM4 L2 = __ , _ A KM4 L3 = __ , _ A</p> <p>Current: 3.5A ~4.0 A</p>	<input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>
77.	<p><b>Stop testing unit heater 1 and supply fan 1</b></p> <ul style="list-style-type: none"> <li>- Set “<b>TM_UH1</b>” to False <b>2min later,</b></li> <li>- Set “<b>TM_SAF1</b>” to False</li> </ul>	<p>KM4 is OFF. 2min later, KM8 is OFF.</p>	<input type="checkbox"/>
78.	<p>Start supply fan 2 low speed <b>Ventilation</b> test mode</p> <ul style="list-style-type: none"> <li>- Switch SA3 to ‘Low ventilation’</li> <li>- Mark the signal <b>TM_SAF2</b></li> <li>- Push the red arrow button</li> </ul> <p>Check input</p>	<p>Reading: <b>TM_SAF2</b> Command: FALSE OR 0L Status: ENDED KM6 and KM11 ON</p> <p>Supply fan 2 low speed running Reading: <b>TM_SAF2</b> Command: TRUE OR 1L Status: RUNNING <b>DI_05_SAF2 =1L</b></p>	<input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>

step	Activity	Response / PC-display	OK
79.	<ul style="list-style-type: none"> <li>- Check sense of rotation on motor <b>supply air fan 2</b></li> <li>- Measure current consumption using current probe</li> <li>-</li> </ul>	<p>Sense of rotation acc. to arrow on motor</p> <p>KM11 L 1 = __ , _ A</p> <p>Current: 0.3A ~ 0.5A</p>	<input type="checkbox"/>
80.	<p>Start supply fan 2 high speed <b>Ventilation</b> test mode</p> <ul style="list-style-type: none"> <li>- Switch SA3 to 'High ventilation'</li> <li>-</li> </ul> <p>Check input</p>	<p>Reading: <b>TM_SAF2</b></p> <p>Command: FALSE OR 0L</p> <p>Status: ENDED</p> <p>KM6 and KM10 ON</p> <p>Supply fan 2 high speed running</p> <p>Reading: <b>TM_SAF2</b></p> <p>Command: TRUE OR 1L</p> <p>Status: RUNNING</p> <p><b>DI_05_SAF2 =1L</b></p>	<input type="checkbox"/>          <input type="checkbox"/>
81.	<ul style="list-style-type: none"> <li>- Check sense of rotation on motor <b>supply air fan 2</b></li> <li>- Measure current consumption using current probe</li> <li>-</li> </ul>	<p>Sense of rotation acc. to arrow on motor</p> <p>KM11 L1 = __ , _ A</p> <p>Current: 0.5A ~ 0.7A</p>	<input type="checkbox"/>
82.	<p><b>Start unit heater 2 testing</b></p> <ul style="list-style-type: none"> <li>- Set "<b>TM_UH2</b>" to TRUE</li> <li>- Check AI_01_SAS DI_04_UH2</li> <li>- Measure the current</li> </ul>	<p>Read: <b>TM_UH2</b></p> <p>Command: true or 1L</p> <p>Status: running, KM5 ON</p> <p>AI_01_SAS goes up. DI_04_UH2 =1L.</p> <p>KM5 L1 = __ , _ A KM5 L2 = __ , _ A KM5 L3 = __ , _ A</p> <p>Current: 3.5A ~ 4.0A</p>	<input type="checkbox"/>          <input type="checkbox"/>

step	Activity	Response / PC-display	OK
83.	<b>Stop testing unit heat 2</b> - Set "TM_UH2" to False <b>2min later,</b> - Set "TM_SAF2" to False	KM5 is OFF. 2min later, KM6 is OFF.	<input type="checkbox"/>
84.	Start supply fan 2 emergency heating mode - Switch SA3 to 'Emergency Heating'	KA1, KA5 are ON; KM5, KM9 are ON  Supply air fan 2 is low speed running	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
85.	- <b>Start test emergency ventilation</b> - - <b>If car can provide 250V, then ignore below actions!!!</b> - <b>Switch off QF7 (110VDC)</b> - <b>Remove X01 to switch off 400V</b> - Remove wire 917 on terminal 14 on Power detector - <b>Install on X01 to switch on 400V</b>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
86.	- Check AI_03_PWR  DI_07_ESAF  Contactor KM09 - Check sense of rotation on motor <b>supply air fan 1</b> - Measure the current	AI_03_PWR = ~9.5C (only with 250V power supply) DI_07_ESAF = 1L  KM09 is ON  KM9 L1 = __ , _ A  Current: 0.9A ~ 1.5A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
87.	Go to System Overview in the main menu  - open complete list  Select "Event Memory"	A new window is opened.	<input type="checkbox"/>

step	Activity	Response / PC-display	OK
88.	<b>Erase of Event Memory</b> - Double click on the button <b>“ERASE EVENT MEMORY”</b>		<input type="checkbox"/>
89.	<b>Erase of Component Memory</b> - Double click on the button <b>“COMPONENT MEMORY”</b>		<input type="checkbox"/>
90.	<u>Reset of controller:</u> switch OFF 110 V DC ( <b>QF7</b> ) for 5 sec. after 5 sec. 110 V DC is switched ON again	Controller makes a reset and starts again	<input type="checkbox"/>

## 4 ABBREVIATIONS AND DEFINITIONS

<b>110V DC</b>	110V direct current power supply – (Control voltage)
<b>400V AC</b>	400V alternating current power supply (power device)
<b>AI...</b>	Analog input with number
<b>AM</b>	ATTIKO Metro
<b>AS</b>	Application software
<b>DI...</b>	Digital input with number
<b>DQ...</b>	Digital output with number
<b>DSP</b>	Digital signal process
<b>EHD</b>	Engineering HVAC Department
<b>FAS</b>	Fresh air temperature sensor
<b>FPC08</b>	FAIVELEY PLC
<b>FTL</b>	FAIVELEY Transportation Leipzig
<b>GND</b>	Ground
<b>HVAC</b>	Heating Ventilation and Air Conditioning
<b>I / O</b>	Input / Output
<b>IBS View</b>	System I/O overview
<b>KM...</b>	Contactors name with number
<b>LED</b>	Light emitting diode
<b>MONA</b>	FAIVELEY Service Software
<b>MVB</b>	Multifunctional Vehicle Bus
<b>OS</b>	Operating software
<b>QF...</b>	Circuit breaker with number
<b>RAS</b>	Return air temperature sensor
<b>RS232</b>	Serial interface
<b>RD</b>	Receive data
<b>TD</b>	Transmit data
<b>Te</b>	Outside air temperature
<b>TIC</b>	Set-point temperature
<b>Unit1</b>	First independent VAC part
<b>Unit2</b>	Second independent VAC part