

ENGLISH

User Manual

Navigator Card

Hw Rev. 1.20

English

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1. Introduction

1.1 Foreword

Unit management and diagnostic runs in parallel to the level of service that a company can provide. There are several parameters to be watched in order to understand how the machine runs and in order to anticipate possible failure, which may happen into the unit.

To reach this target it is necessary to equip each unit with the Navigator card, which can store all the necessary information for a programmable period. The Navigator Card shall be connected with the Microface in order to share the information collected. For this purpose a particular Eprom shall be installed in the Microface and in the Hiromatic to manage and evaluate the further data collected.

This User Manual describes the Navigator Card and contains information concerning the architecture of the refrigerant diagnose system.

2. Hardware

2.1 Navigator Card

The Navigator Card, is a microprocessor-based electronic board, which is used to offer the option to monitor some additional temperature and pressure sensors, capable to detect fundamental parameters to understand how the refrigerant circuit works.

These parameters are:

- Evaporating Pressure (Low pressure)
- Condensing Pressure (High pressure)
- Refrigerant discharge Temperature
- Refrigerant suction Temperature
- Refrigerant liquid Temperature

The refrigerant diagnosis requires 3 additional PTC-temperature sensors and 2 pressure sensors for each refrigerant circuit. Those information will be evaluated by the Microface.

To connect this sensors to the Microface an additional Navigator-card is necessary (2 for twin-circuit units). The Navigator-card shall be connected to the Microface through Hirobus.

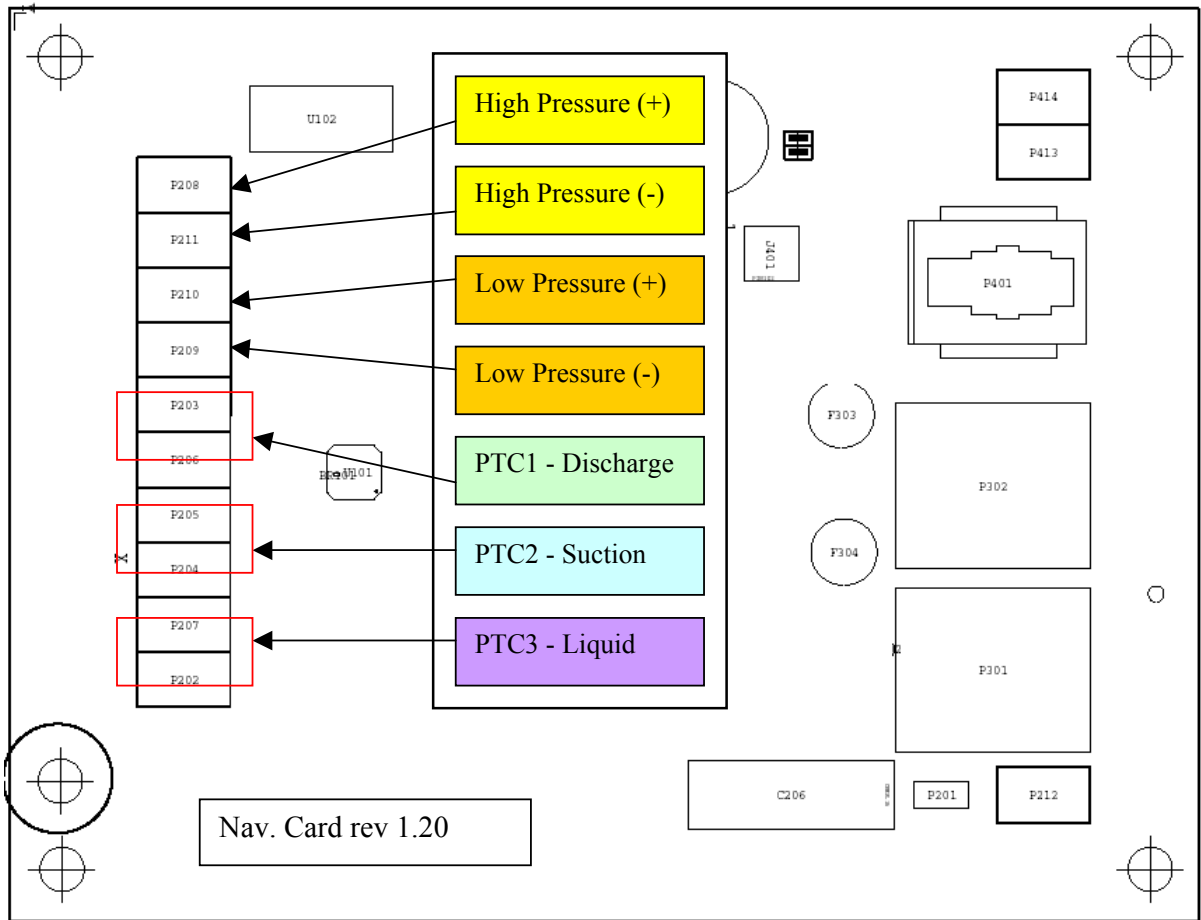


Never add / remove Jumpers when Hirobus is connected on the Navigator!

The Navigator Card can also be suitable to get the low pressure measurement, for single or twin compressor circuit, in case to use the Fc+Dx options set in the software (see Sw manual).



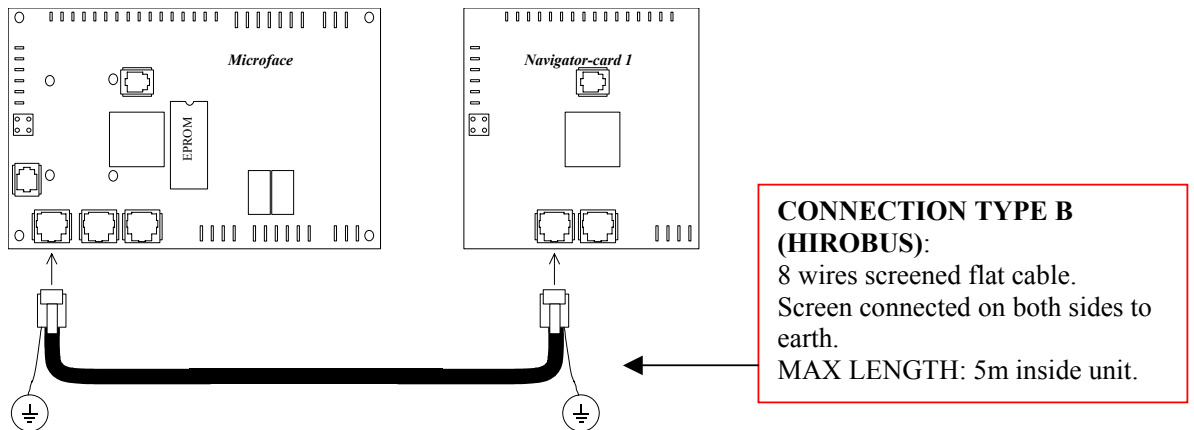
2.1.2 Details of Inputs



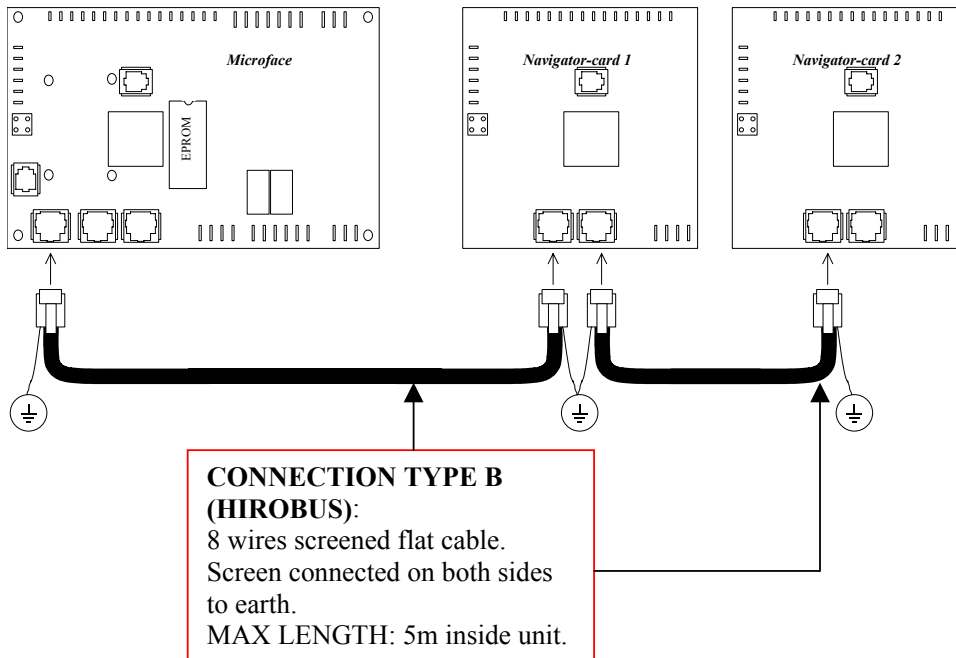
2.2 Hw Configuration

2.2.1 Hirobus connection

The refrigerant diagnosis, as said above, requires 3 additional PTC-temperature sensors and 2 pressure sensors for each refrigerant circuit. To connect this sensors to the Microface the Navigator-card shall be connected to the Microface through Hirobus, in the following way:

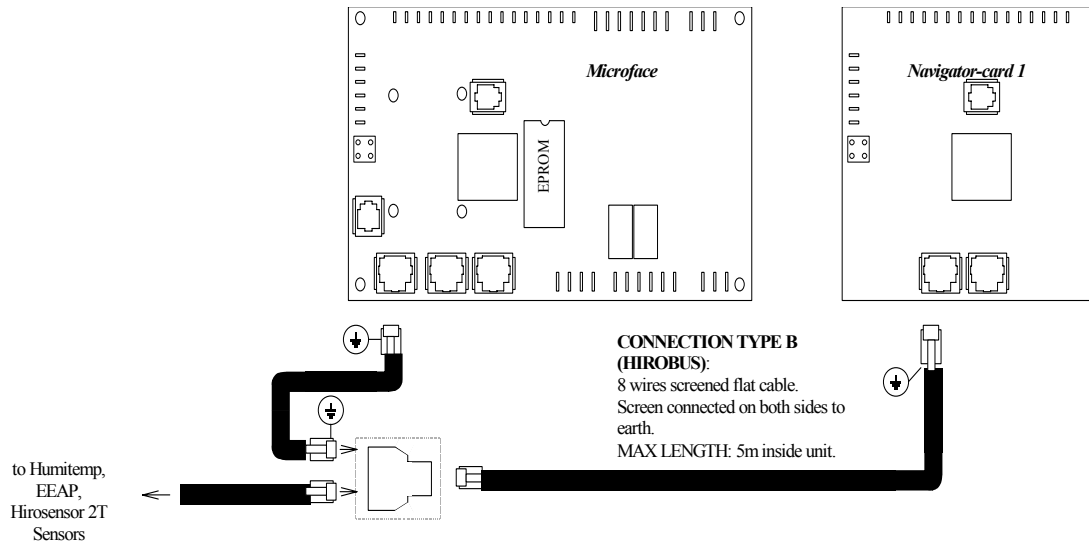


For twin-circuit units an additional Navigator Card shall be used and connected with Hirobus as in the following drawing:

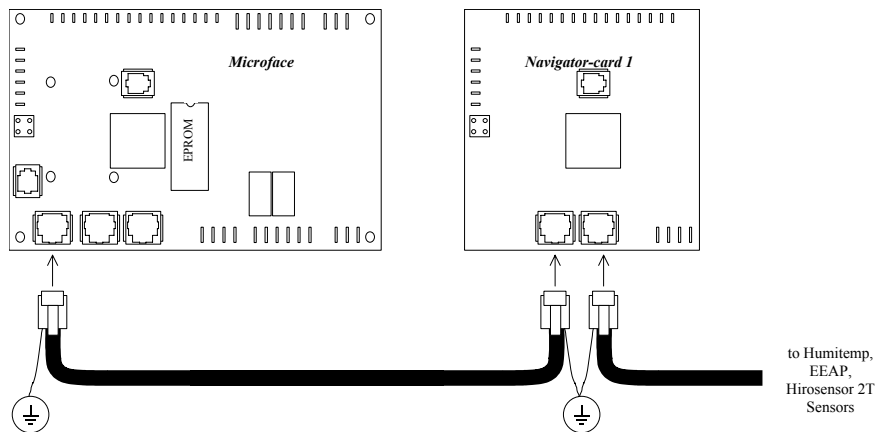


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In case of other devices are connected on the same bus, like Humitemp, they can share the same bus as in the example indicated.



The T-adapter is necessary only in case the position of the Navigator board is not closer to the MicroFace. Otherwise the Humitemp can be connected directly to the Navigator card as indicated in the picture below:

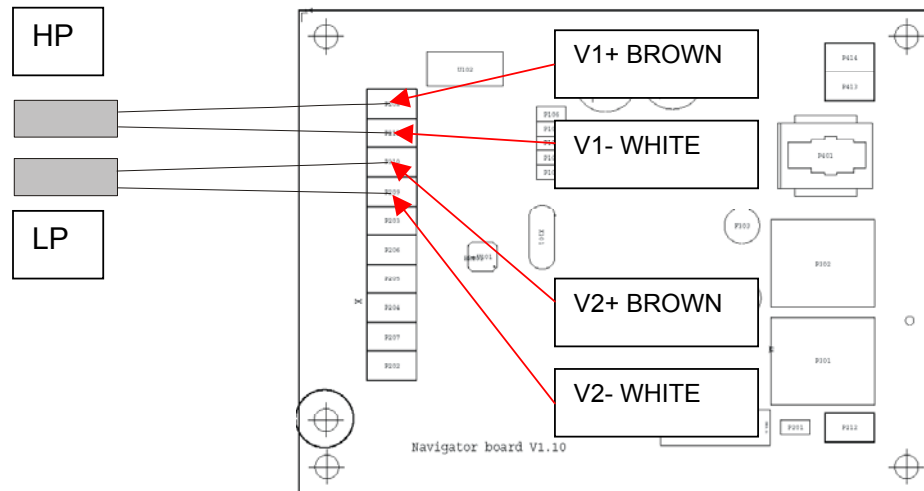


2.2.2 Sensor connection

The suitable pressure transducer to be connected to the Navigator card are the following:

High pressure:	Keller PA	21, range 0..30bar, LH code 275306
Low pressure:	Keller PA	21, range 0..10bar, LH code 275304

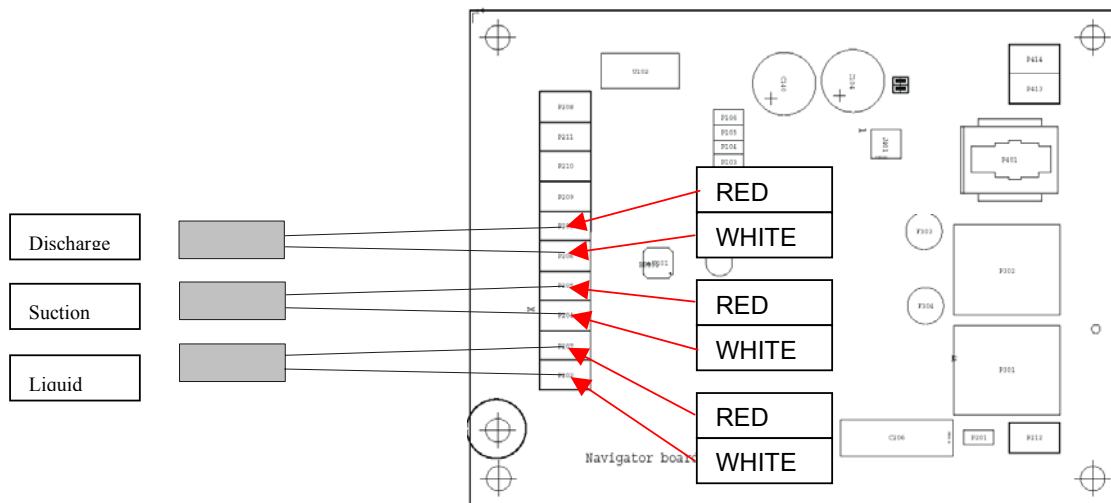
The pressure transducers shall be connected in the following way to the board:



The PTC sensor for the connection to the Navigator card are the following:

PTC length 2mt,	LH code 275183
PTC length 10mt,	LH code 275155

The PTC sensor shall be connected to the board as the picture below:



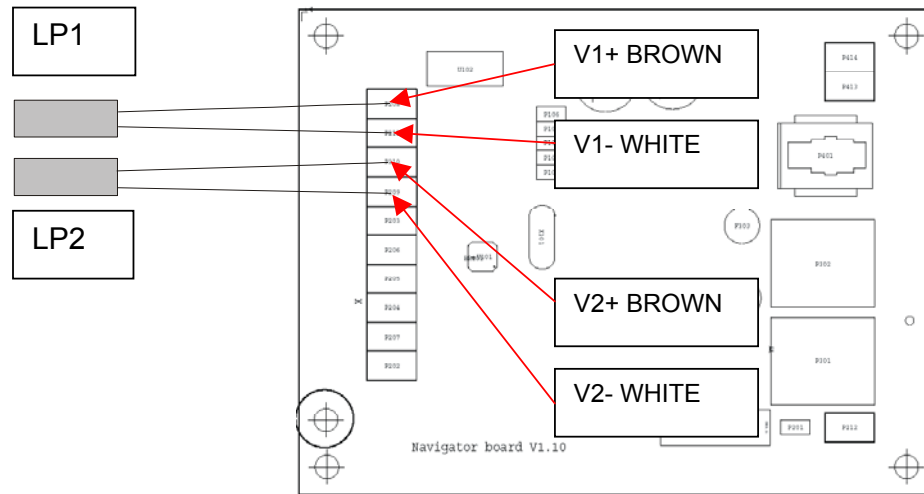
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In case of using the Navigator card in Address 3 (for Fc + Dx) the following configuration shall be used:

The suitable pressure transducer to be connected to the Navigator card are the following:

Low pressure 1st compressor: Keller PA	21, range 0..10bar, LH code 275304
Low pressure 2nd compressor: Keller PA	21, range 0..10bar, LH code 275304

The pressure transducers shall be connected in the following way to the board:



The order connection shall be according to chapter 2.1.2 and the following table resume the connection order:

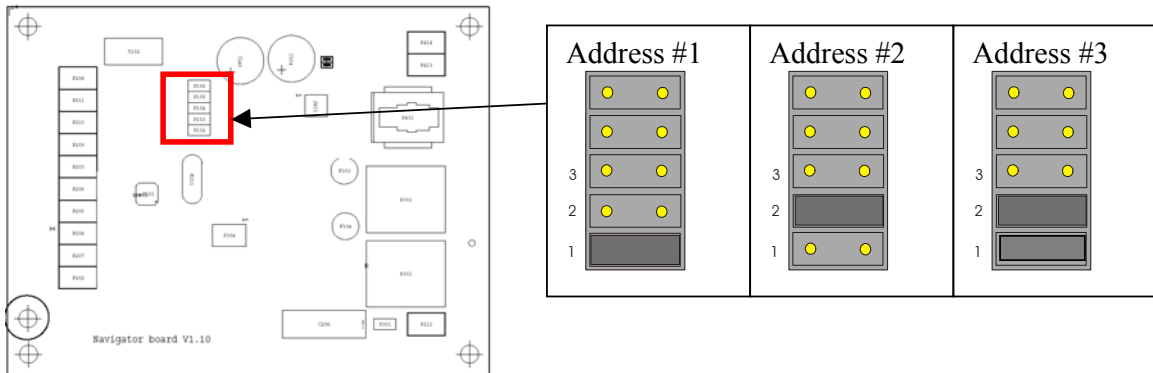
<i>Navigator Card Layout</i>	<i>Input</i>	<i>Purpose</i>
V1+	High pressure supply	Condensing pressure
V1-	High pressure signal	
V2+	Low pressure supply	Evaporating pressure
V2-	Low pressure signal	
PTC1	Temp. Sensor1	Refrigerant Discharge temperature
PTC2	Temp. Sensor2	Refrigerant Suction temperature
PTC3	Temp. Sensor3	Refrigerant Liquid temperature

2.2.3 Addressing

When Navigator Cards are connected with HIROBUS, it is necessary to assign a different address to each of them, by means of jumpers on the board.



The units must be addressed starting from #1, consecutively. If there are 2 Navigator cards on the same unit, they shall have address 1 and 2. In case of using the Navigator as expansion board for Fc+Dx, single or dual compressor, Address 3 shall be selected.

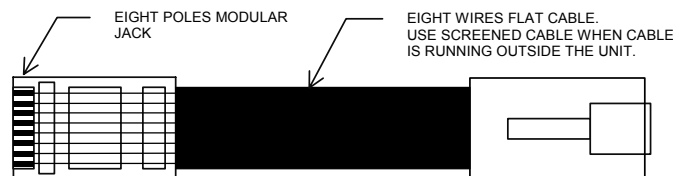


2.3 Hirobus

The connections between Navigator and Microface are carried out with cables having a eight wires and RJ45 male connector plugs. Following you can find how these cables have to be done. For the type of cable and connectors refer to the spare part list included in this manual.



Please note that a wrong connection could cause serious problems to the electronic devices (Microface and Hiromatic); for this reason we strongly recommend to use only first quality products or to buy the cables directly from your sales reps..



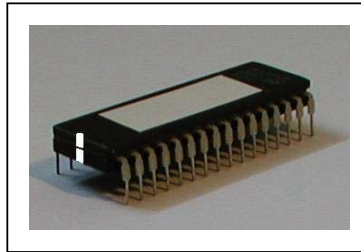
Eight-wires HIROBUS cable for Navigator connections, eight poles connectors;

2.4 EPROM

The Eprom is the device, which stores the Program the Microface has to work with. It doesn't store any user-settings; this is done by the Microface itself (in the RAM and the E²Prom). The Version Name and the Number are printed on the Label of the Eprom.

The following Eproms shall be used to embed the Navigator Card in the

EVM 1.60.043 (or higher) 2 MBit	HPAC, for Microface E 24VAC/DC
E48 1.60.043 (or higher) 2MBIT	HPAC, FOR MICROFACE E 48VDC
E1G 1.60.043 (or higher) 2 MBit	HPAC, for HIROMATIC G
EVGL1 1.60. 043 (or higher) 4 MBit	HPAC, for HIROMATIC E
EVGL1 2.60. 043 (or higher) 4 MBit	HPAC, for HIROMATIC E

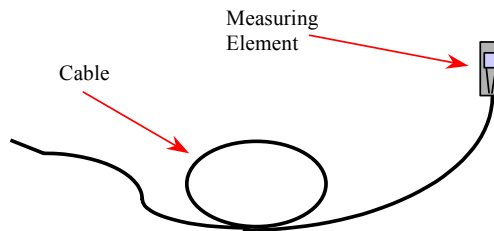


Un-power the Microface before mounting/dismounting the Eprom. Remove Eprom only with special tool; never use a Screwdriver. For correct direction of mounting please refer to the Micorface and Hiromatic Manuals. Compare the Mark in the Eprom with the direction in the Drawing.

2.5 Sensors

PTC Temperature Sensor

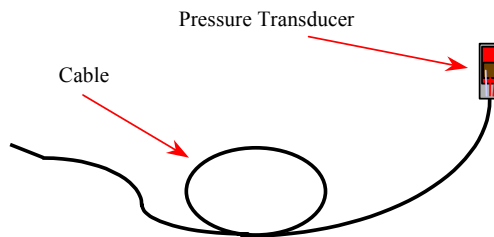
The PTC Sensor is used in Air-Conditioners as well as in Chillers/Superchillers. There are different Types and lengths available: please refer to the Spare Part List. PTC Sensors are temperature-sensors, changing the resistance according to the temperature (positive temperature coefficient). The connection is 2 poles. The length of the cable for the sensor ranges from 1.5 to 10 meters.



PTC Sensor

Pressure Transducers

The KELLER Series 21/21PRO are extremely reliable and cost effective pressure transmitters. They are used to convert hydraulic or pneumatic pressure into an electrical current output signal in the range 4..20 mA, linearly proportional to the input pressure. The signal can be sent directly to the Navigator Card which provides also to furnish the phantom supply for the transducer. The connection is 2 poles. The length of the cable for the transducer is 2 meters.



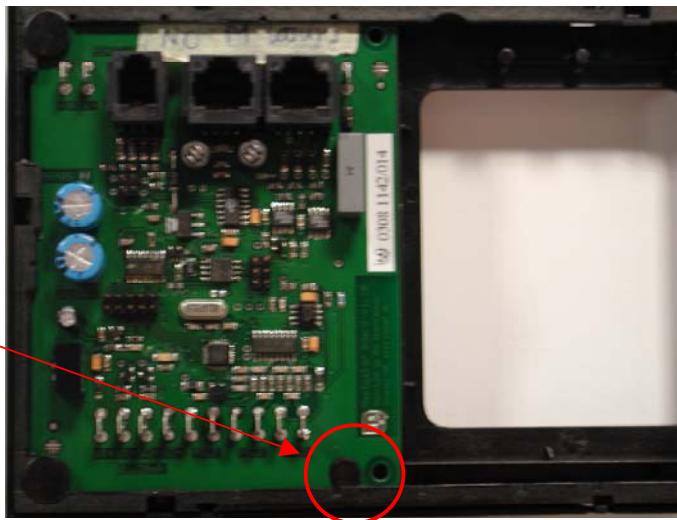
Pressure Transducer

2.6 Housing

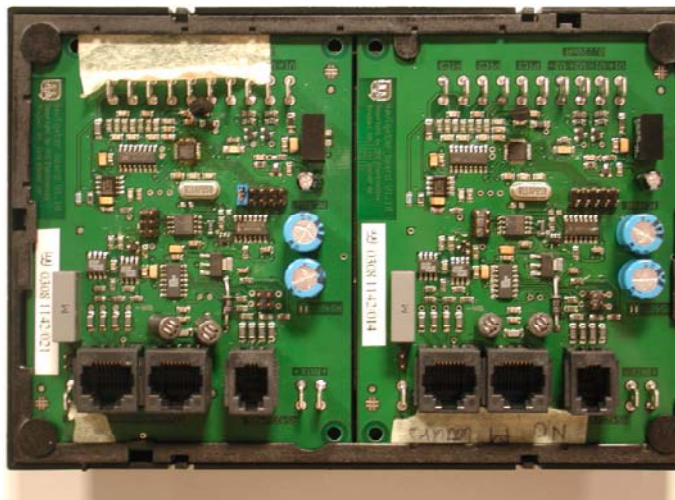
The Navigator card is compatible with the Microface housing, as indicated in the following pictures. This encasing could be used as alternative solution to the 4 plastic pins.

Usage of microface's housing for one Navigator.

Note the stop point on the plastic

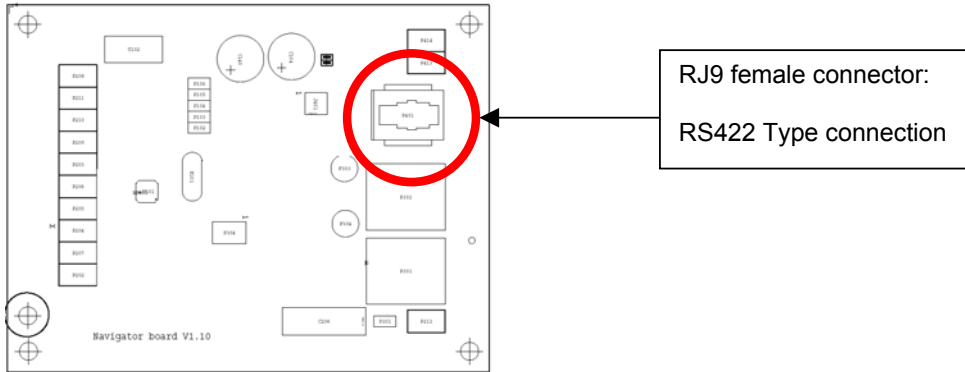


Usage of microface's housing for two Navigator.



2.7 RS422 Connection

To download the data stored in the navigator it is necessary to use a RS422/RS232 converter. The connector where to attach the cable is indicated in the picture below:



The PinOut of the connector is the following:

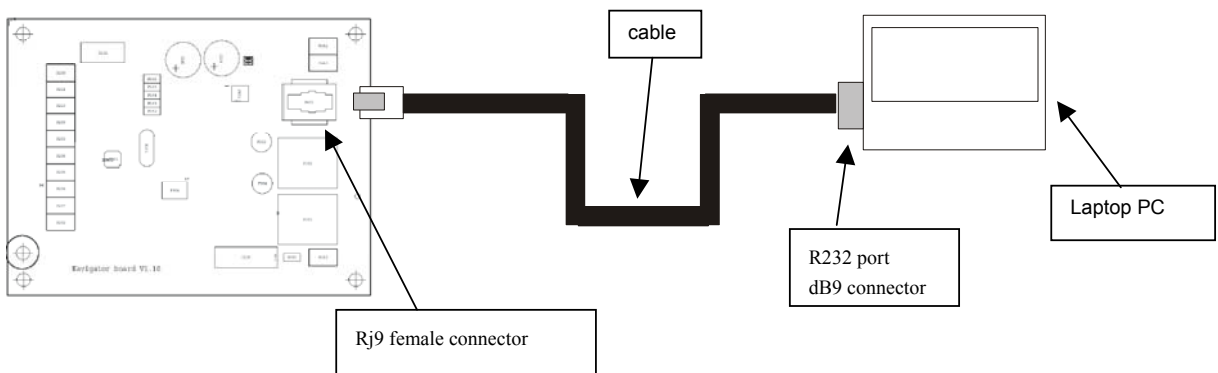
Connector RJ9:	
1	RS422 RX-
2	RS422 RX+
3	RS422 TX-
4	RS422 TX+

The parameters issued by the communications are the followings:

57600 bauds
8 data bits
No parity
1 bit stop
No flow control

LH according the following code codifies the suitable cable, for issue the communication within the card and the PC.

The cable shall be connected in the following way to download data from the card:



3. Data Memory

To download the data, special software shall be installed on the Laptop Pc to permit the communication with the Navigator card.

For downloading of the logged data it is necessary only to connect a PC to the RS422 port of the Navigator card (using a specific cable) and to run a specific download application.

The application exports all logged data automatically in Excel-format for further processing.

The program itself connects through one of the computer's com-ports, it is enough to "CONNECT" and to "GET DATA".

3.1 Data storing

The Navigator card has a 4 MBit flash memory on board, which allows to store the logged data.

For logging intervals every 1 second, all 5 sensors, the logging time is 22,4 hours.

For logging intervals every 5 seconds, only 1 sensors, the logging time is 560 hours.

The selectable logging interval ranges **from 1 second** (22,4 hours for 5 sensors, 112 hours for 1 only sensor) to **12,75 minutes** (app. 2 years for 5 sensors, app. 10 years for 1 only sensor).

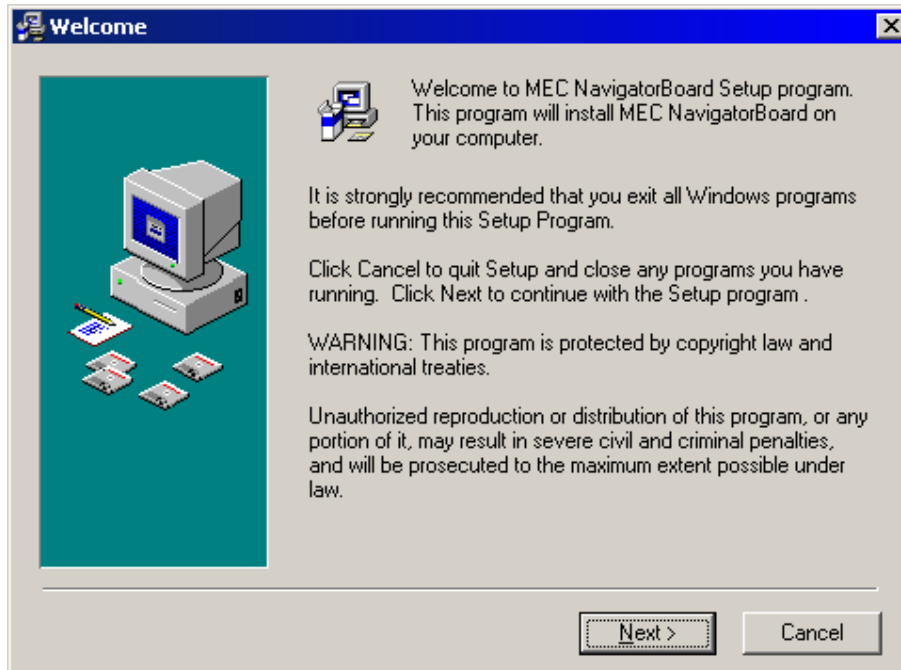
Logging of various sensors can be enabled / disabled separately for each individual sensor, the logging interval can be set and is valid for all sensors with logging enabled.

In case of exceeding a specific threshold (example: dangerous high pressure), the logging interval changes automatically to 1 second. If this "critical operating mode" is passed without any cut-out of safety devices, the original logging interval will be set back.

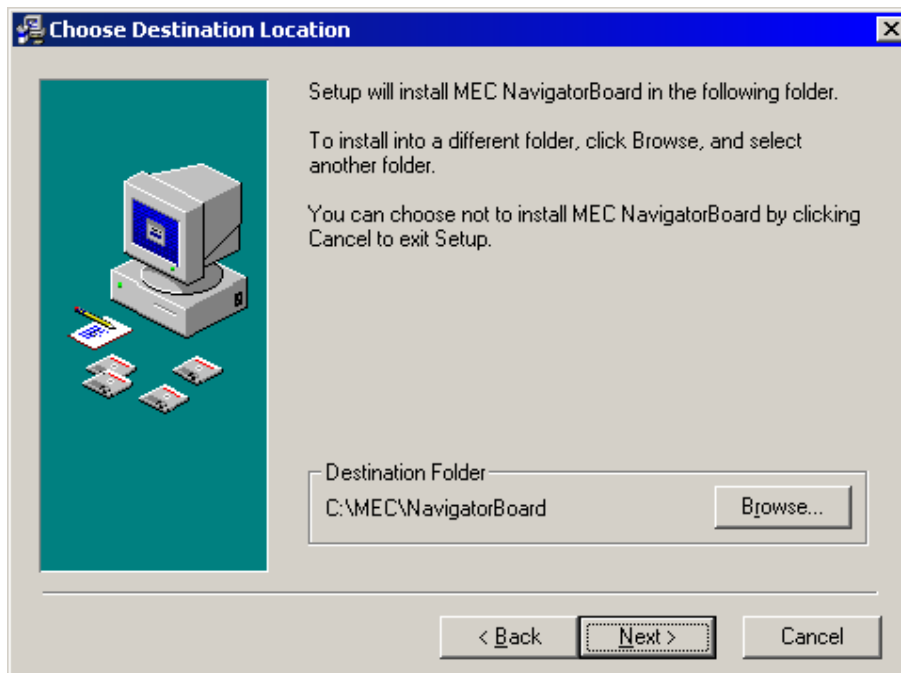
If the critical operation results in a compressor failure, the logging will stop 5 minutes after the failure, with the advantage that the logging resolution, regardless which general logging interval was set, is 1 second – when reaching the "critical operating mode" until 5 minutes after the fault.

3.2 Software installation

The file is distributed and stored inside a Zip archive, named as **Nav031203.zip**. Once decompressed it generates a file Named as Nav.exe. Launching this file the Pc will proceed automatically to create the installation of the program:

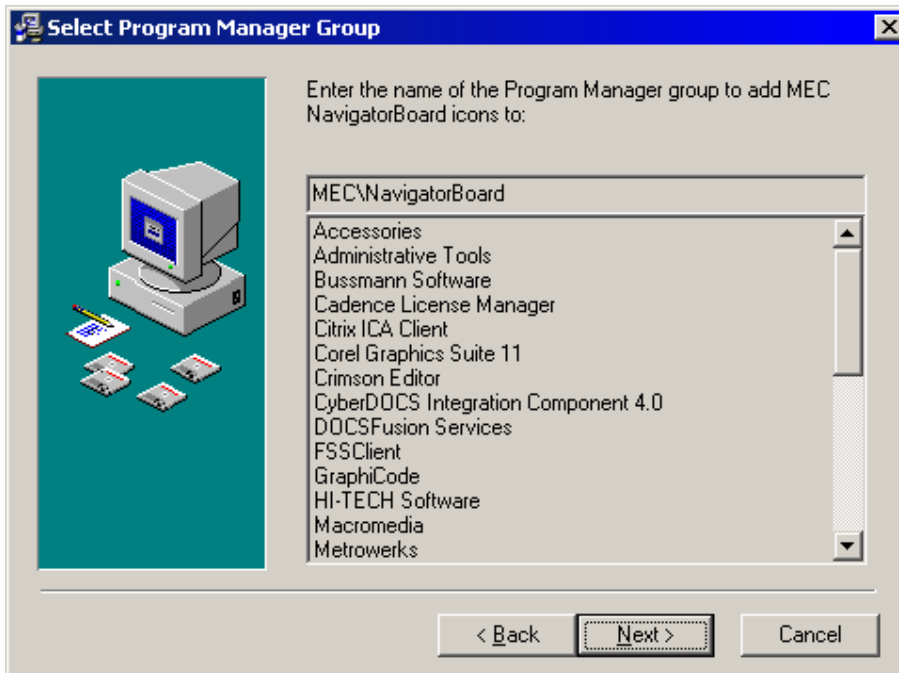


Once compared the above window press “Next” to go on with the installation.

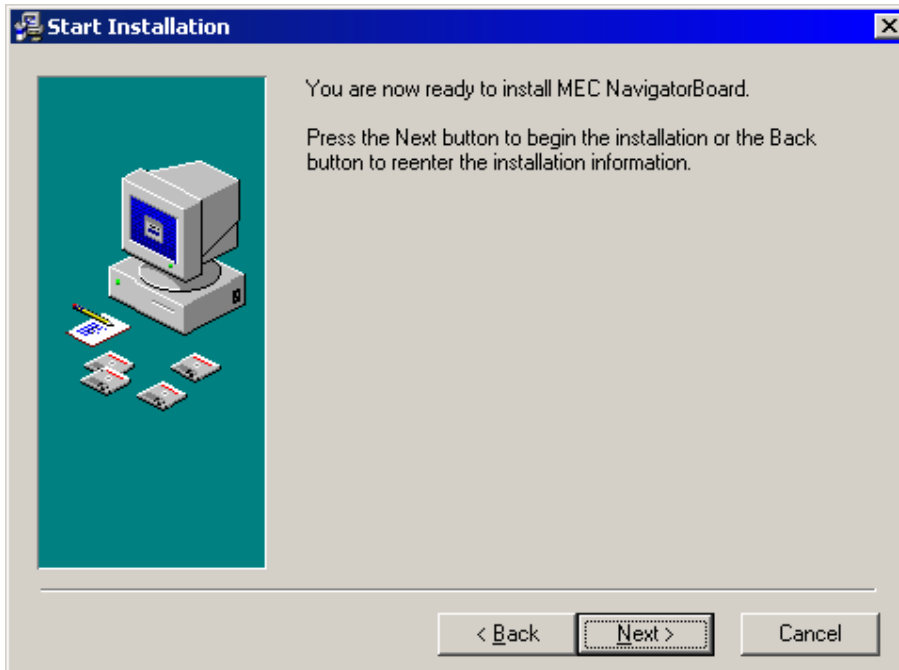


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Select the Destination Folder for installing the software. Please note that the Data will be stored inside the same destination. So make sure it will be in a safe place easy to recover and find in your PC configuration.

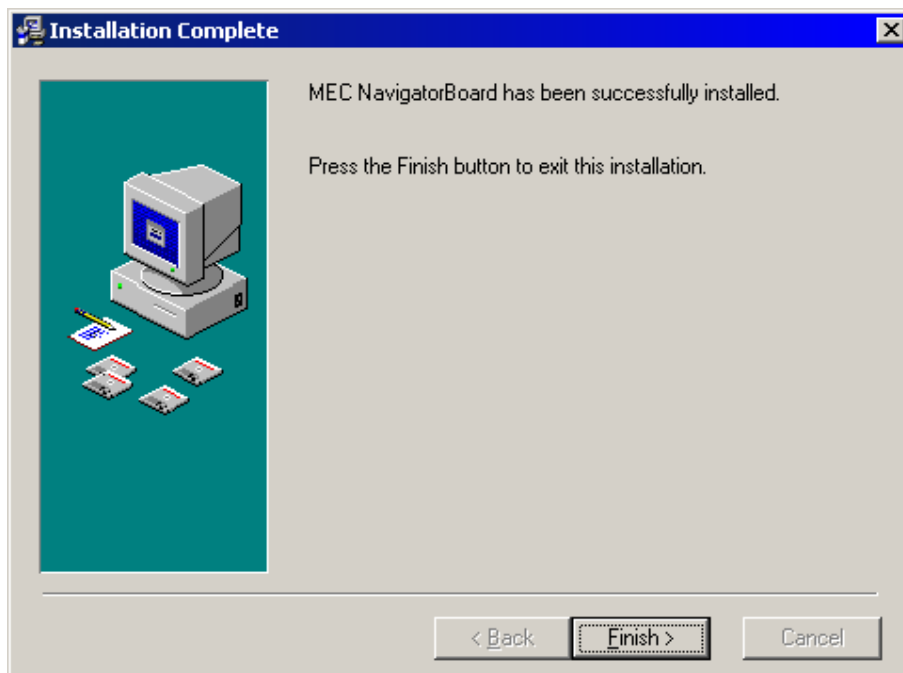


The installation program will ask you the name of the program manager group that will be created. Press "Next " if you don't want any modifications to the default options; otherwise proceed to modify the group name.



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Finally, pressing “Next”, the last warning will let to start the installation of the main program in your PC.

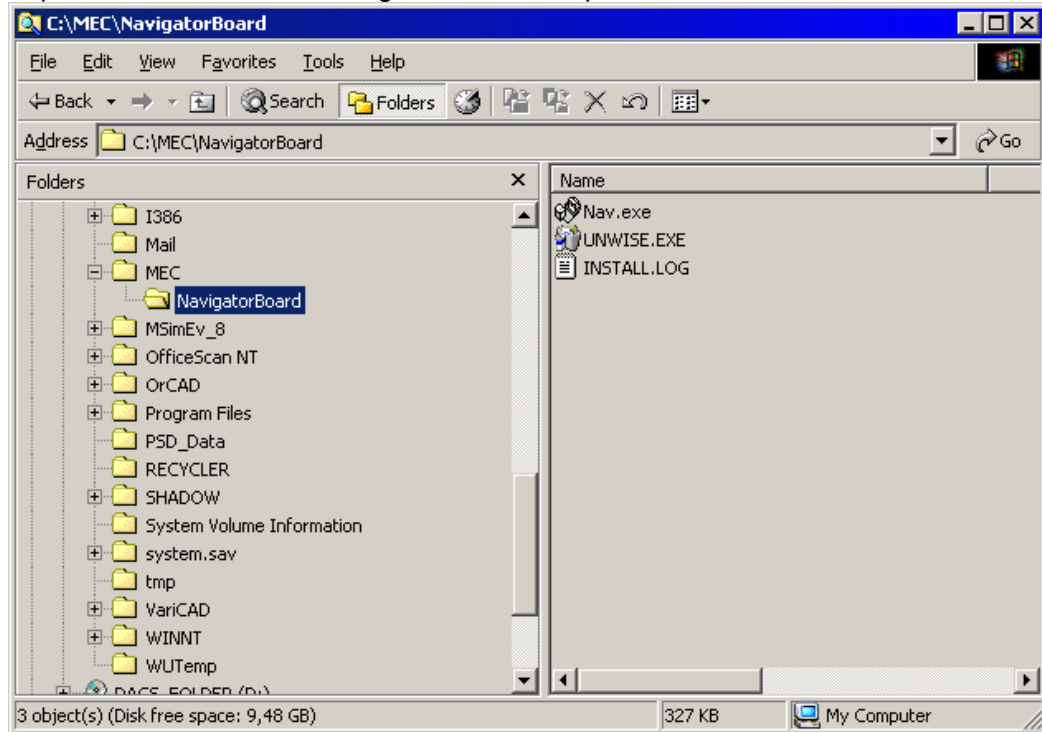


At the end of the successfully installation the above message will be displayed. Press “Finish” to go ahead.

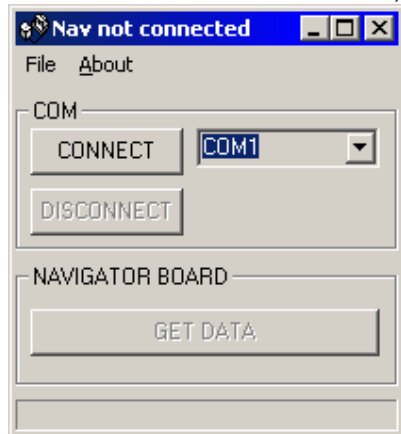
3.3 First run configuration

Once finished to install the program the following steps should be performed in order to ensure the correct data synchronization between the data stored in the Navigator Card and the indication of the Hiromatic display:

- 1) Go to the folder where you have installed the program. (For example, as the case above: C:\MEC\NavigatorBoard).
- 2) Explore the folder, the following files should be present:



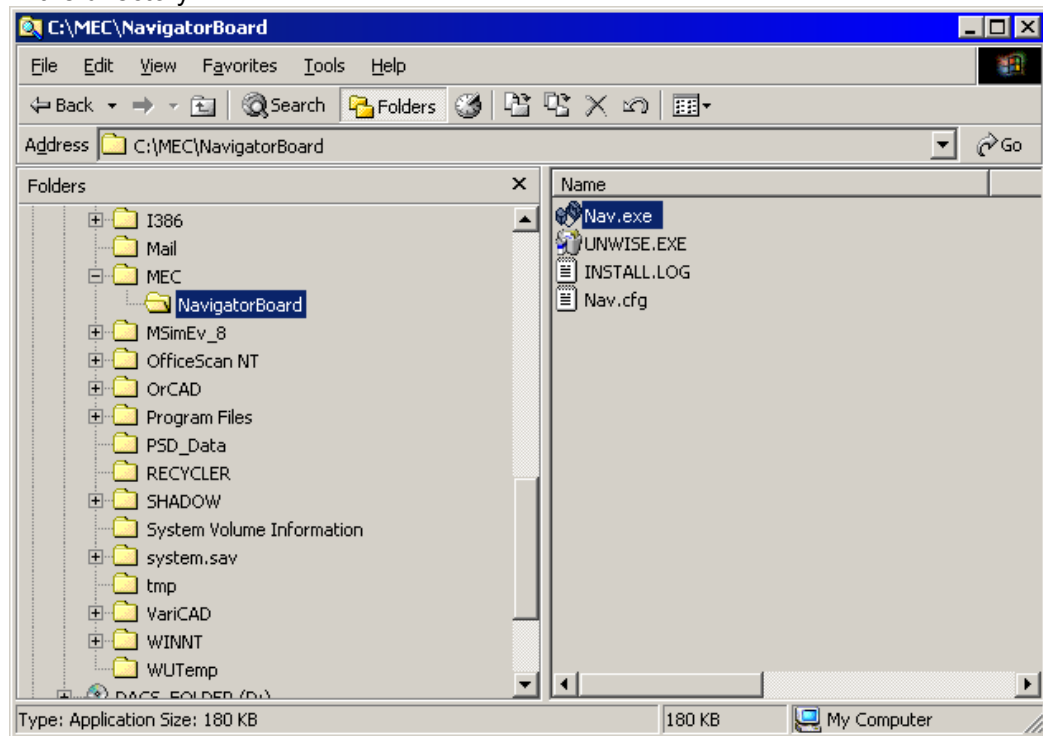
- 3) Double click on the Nav.exe file, the following window shall appear:



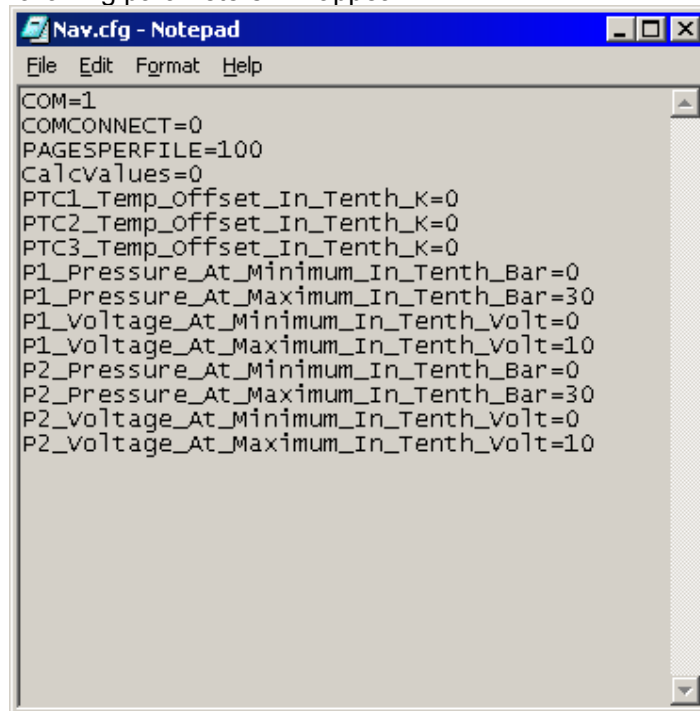
- 4) Go to File and select Exit.

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- 5) Return to explore the folder, now a file named as Nav.cfg should be present in the directory:



- 6) Open the Nav.cfg file with a normal text editor (for example Notepad), the following parameters will appear:



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7) MAKE the following modification:

a) Change CalcValues from 0 to 1.

b) Insert the PTC correction according to the settings made on the Hiromatic window MULTIPLIED by 10.

Example:

If in the Hiromatic window the following offsets were selected:

520 NAVIGATOR 6 / 6 (CALIBRATION)				UNIT 1
521	PW (L0) ? ? ? ?	READ OFFSET		
522	C1 DISCH. T	30.5	0,7	°C
523	C1 SUCT. T	30.5	2,6	°C
524	C1 LIQU. T	30.5	+ 0.0	°C
525	C2 DISCH. T	30.5	+ 0.0	°C
526	C2 SUCT. T	30.5	+ 0.0	°C
527	C2 LIQU. T	30.5	+ 0.0	°C

In the Nav.cfg file the following variables should be changed accordingly to it:

PTC1_Temp_Offset_In_Tenth_K=7
PTC2_Temp_Offset_In_Tenth_K=26
PTC3_Temp_Offset_In_Tenth_K=0

c) Insert the High and low pressure settings accordingly to what selected in the Hiromatic MULTIPLIED by 10.

Example:

If in the Hiromatic window the following correction parameters were selected:

490 NAVIGATOR 3 / 6 (SETUP)				UNIT 1
491	REFRIGERANT:			R407C
492	HP1:	0.0V= -7,5 bar	10V= 31,0	bar
493	LP1:	0.0V= -2,5 bar	10V= 10,5	bar
494	HP1 / LP1:	4.7V 12.3 bar	2.5V 5.7	bar
495	HP2:	0.0V= -6.0 bar	10.0V= 30.0	bar
496	LP2:	0.0V= -6.0 bar	10.0V= 10.0	bar
497	HP2 / LP2:	4.7V 12.3 bar	2.5V 5.7	bar

In the Nav.cfg file the following variables should be changed accordingly to it:

P1_Pressure_At_Minimum_In_Tenth_Bar= -75
P1_Pressure_At_Maximum_In_Tenth_Bar=310
P1_Voltage_At_Minimum_In_Tenth_Volt= 0
P1_Voltage_At_Maximum_In_Tenth_Volt=100
P2_Pressure_At_Minimum_In_Tenth_Bar= -25
P2_Pressure_At_Maximum_In_Tenth_Bar=105
P2_Voltage_At_Minimum_In_Tenth_Volt=0
P2_Voltage_At_Maximum_In_Tenth_Volt=100

- 8) Save the configuration and exit the text editor.

Standard configuration

The following configuration parameters should be applied for the High and Low pressure sensors:

High Pressure:

SENSOR OFFSET (hp)
0.0V=-7,5 bar / 10V=31.0 bar

Low Pressure:

SENSOR OFFSET (lp)
0.0V=-2.5 bar / 10V=10.5 bar

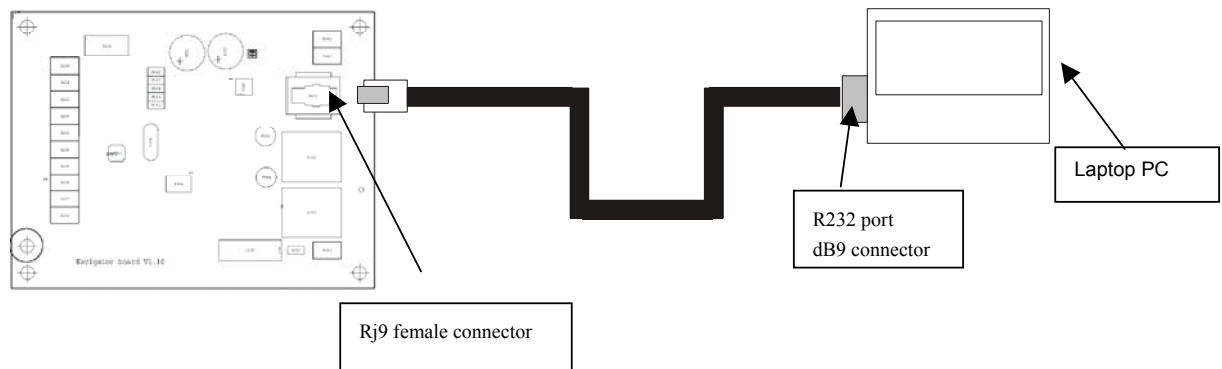
Once configured the system the data read from the Hiromatic through the Navigator must coincide both with the manometer indication on the machine and with the indication of data to download.

The following tables were verified for both high and low pressure.

3.5 Data downloading

Once configured the system accordingly to the steps above, it is possible to download the data stored in the non-volatile memory of the navigator following the next steps:

- 1) Connect Rs422/232 cable according the picture below:



- 2) Make sure you have the following settings on your operative system:
Time: hh:mm
Date: gg.MM.yy
If NOT, please change settings according to it.
- 3) Click on Start> Programs> MEC> NavigatorBoard> Nav

- 4) The following window will appear:



- 5) Click on CONNECT
- 6) Click on GET DATA, starting from this point the program will download the data from the Navigator.
- 7) The data will be stored in a folder named as *Data* under the installation directory. The data will appear as a form of Excel files:

TIME	PTC0	PTC1	PTC2	P1	P2	
13.01.2004 14:10:24	36,2	17,9	27,3	6,3	6,37	Page 1292
13.01.2004 14:10:25	36,2	18,1	27,3	6,3	6,37	
13.01.2004 14:10:26	36,2	18,1	27,2	6,3	6,37	
13.01.2004 14:10:27	36,1	18,1	27,3	6,3	6,37	
13.01.2004 14:10:28	36,1	18,1	27,3	6,3	6,37	
13.01.2004 14:10:29	36,1	18,1	27,2	6,3	6,38	
13.01.2004 14:10:30	35,9	18,1	27,3	6,3	6,38	
13.01.2004 14:10:31	36,1	18,1	27,2	6,3	6,38	
13.01.2004 14:10:32	35,9	18,1	27,2	6,3	6,38	
13.01.2004 14:10:33	35,9	18,1	27,3	6,3	6,38	
13.01.2004 14:10:34	35,9	18,1	27,2	6,3	6,38	
13.01.2004 14:10:35	35,8	18,1	27,2	6,3	6,4	
13.01.2004 14:10:36	35,9	18,1	27,2	6,3	6,4	
13.01.2004 14:10:37	35,8	18,1	27,1	6,35	6,4	
13.01.2004 14:10:38	35,6	18,1	27,2	6,3	6,4	
13.01.2004 14:10:39	35,8	18,1	27,1	6,35	6,4	
13.01.2004 14:10:40	35,6	18,1	27,2	6,35	6,4	
13.01.2004 14:10:41	35,6	18,1	27,2	6,3	6,4	
13.01.2004 14:10:42	35,6	18,1	27,2	6,35	6,4	
13.01.2004 14:10:43	35,5	18,2	27,2	6,35	6,4	
13.01.2004 14:10:44	35,5	18,2	27,2	6,35	6,4	
13.01.2004 14:10:45	35,5	18,2	27,1	6,35	6,4	
13.01.2004 14:10:46	35,5	18,2	27,1	6,35	6,4	
13.01.2004 14:10:47	35,3	18,2	27,1	6,35	6,4	
13.01.2004 14:10:48	35,5	18,2	27,1	6,35	6,4	
13.01.2004 14:10:49	35,3	18,2	27,1	6,35	6,4	
13.01.2004 14:10:50	35,3	18,2	27,1	6,35	6,41	
13.01.2004 14:10:51	35,3	18,2	27,1	6,35	6,41	

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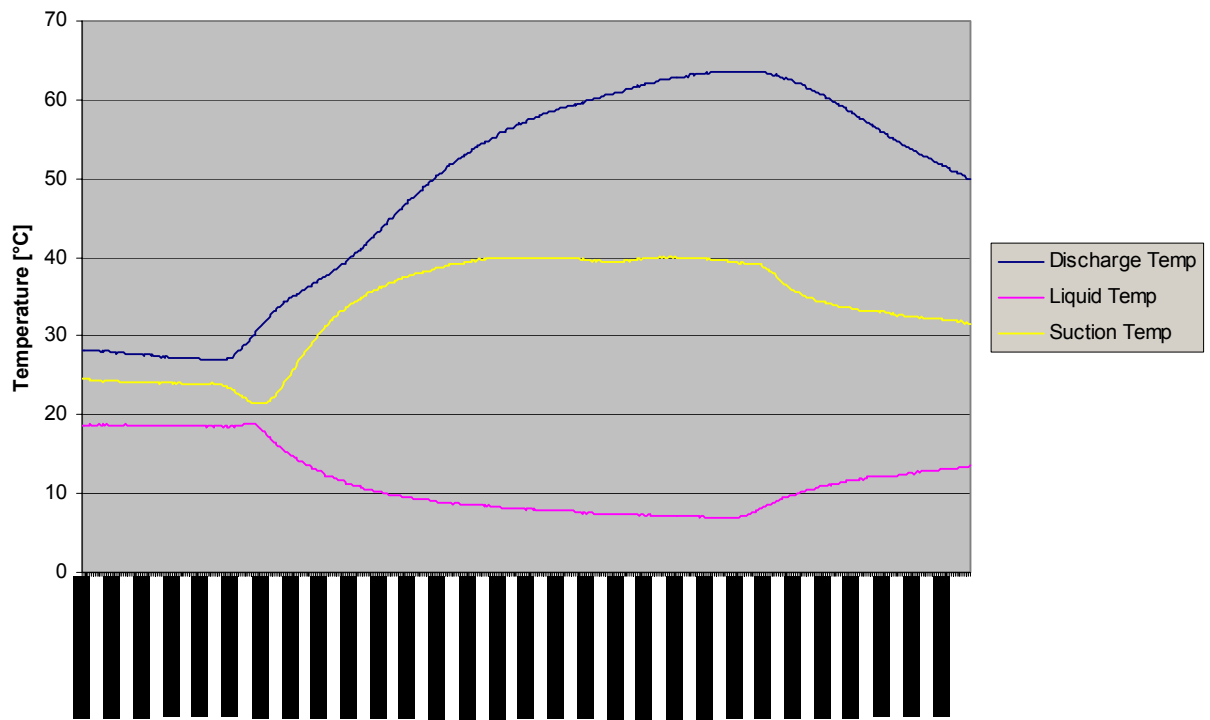
The first column (TIME) indicates the data and the time of the sample stored inside the non-volatile memory of the navigator.

The other columns indicate:

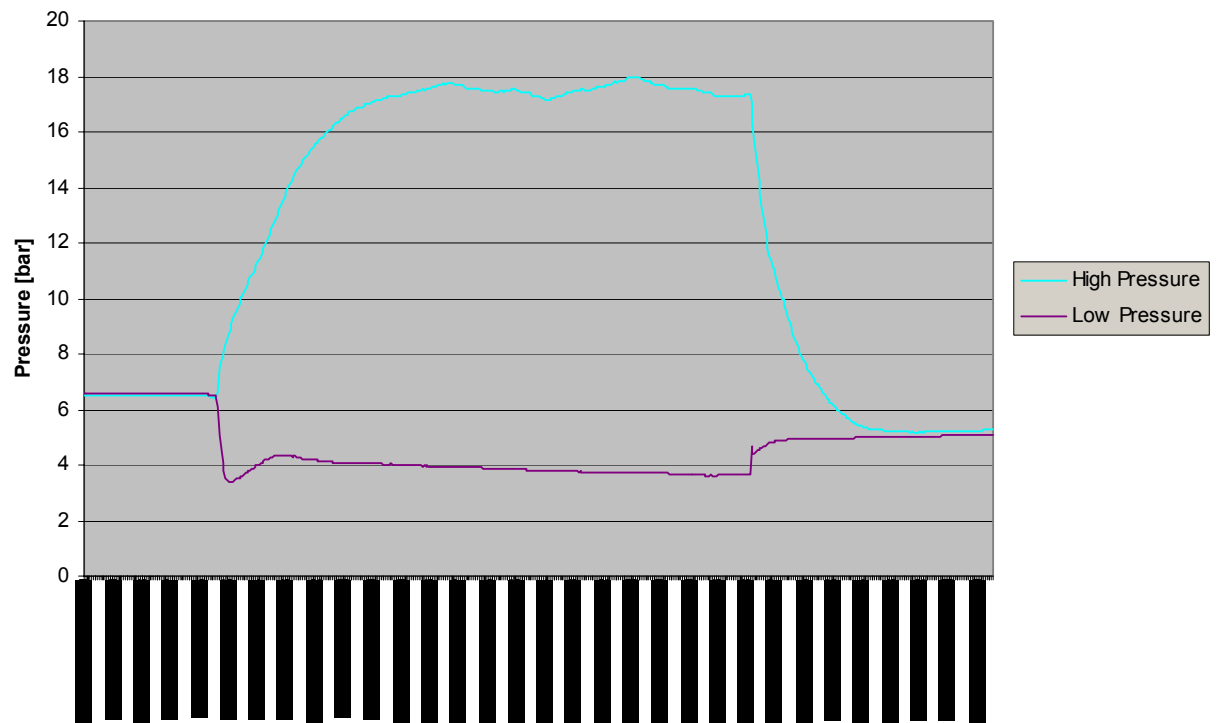
PTC0	Refrigerant discharge temperature
PTC1	Refrigerant suction temperature
PTC2	Refrigerant liquid temperature
P1	High pressure
P2	Low pressure

With this data it is possible to make tables, comparisons and charts:

Temperature Probes - Compressor ON



Pressure Transducers - Compressor ON



4. APPENDIX

4.1 Technical specification

NAVIGATOR CARD	
Power Supply	Directly form HiroBus slave bus
Analogue In (resistive for PTC 2k – KTY81-210 probes)	3
Analogue In (4-20 mA) with 20V phantom supply	2
Storage Temperature	-10 (not condensating) to +65°C
Maximum Operating Temperature	0 (not condensating) to +55°C
Microcontroller	Used ATMEL ATmega8, 10 bit ADC, 8KBytes FLASH, 1KByte RAM, 512Bytes EEPROM
Non volatile memory 4 MBit Memory (Flash) with time/date to store sensors data	EEPROM AT45DB041B with 4Mbit memory (1,000,000,000 write cycles) for about 1000 values with time index

4.2 Spare parts list

DESCRIPTION	CODE
Navigator Card	274010
Pressure Transducer Keller PA21M 0..10 Bar	275304
Pressure Transducer Keller PA21M 0..30 Bar	275306
Microface E (Evolution) board	275297
Probe temperature PTC	275183
Probe PTC 2 kohm L = 10 m	275155
EPROM Microface EVM 160***	275791
EPROM HiromaticE EVEL1 160***	275789
EPROM HiromaticG E1G 160***	275790
Flat cable 8 way M-M L = 1 m	275607
Flat cable 8 way M-M L = 10 m	275610
Flat cable 8 way screened (specify length)	275626
Cable RS422/RS232 converter	274015
Manual Navigator card	272599
Kit Navigator card	480115
Plastic cover for holder	271443
Plastic holder for Microface compatible with Navigator	270002

