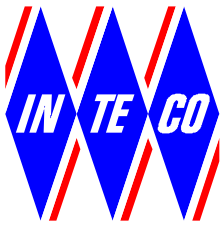
Magnetic Levitation System 2EM

(MLS2EM)

USB2 Version

Installation manual



www.inteco.com.pl

NOTES

SAFETY OF THE EQUIPMENT

The equipment, when used in accordance with the supplied instructions, within the parameter set for its mechanical and electrical performance, should not cause any danger to health or safety if normal engineering applications are observed.

If, in specific cases, circumstances exist in which a potential hazard may be brought about by careless or improper use, these will be pointed out and the necessary precautions emphasised.

Some National Directives require to indicate on our equipment certain warnings that require attention by the user. These have been indicated in the specified way by labels. The meaning of any labels that may be fixed to the equipment instrument are explained in this manual.

Risk of electric shock

PRODUCT IMPROVEMENTS

The Producer reserves a right to improve design and performance of the product without prior notice.

All major changes are incorporated into up-dated editions of manuals and this manual is believed to be correct at the time of printing. However, some product changes which do not affect the capability of the equipment, may not be included until it is necessary to incorporate other significant changes.

ELECTROMAGNETIC COMPABILITY

This equipment, when operated in accordance with the supplied documentation, does not cause electromagnetic disturbance outside its immediate electromagnetic environment.

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ACKNOWLEDGEMENTS

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CONTENTS

1. INTRODUCTION

This manual contains a description of the components of the Magnetic Levitation System, assembly instructions and starting procedures. The procedures described in this manual will ensure correct

- RT-DAC/USB2 interface card installation,
- cable connections between the Mechanical Unit, Power Interface and PC
- starting the system.

2. COMPONENTS OF THE SYSTEM

The following minimum configuration is required:

Hardware:

- Inteco MagLev set-up consisting of the MagLev Mechanical Unit and integrated MagLev Power Interface Unit,
- Computer system based on INTEL or AMD processor.
- Specialised RT-DAC/USB2 I/O board.

Software:

- Microsoft Windows W7/W10x64 and MATLAB 64 bit with Simulink, and Simulink Coder toolboxes (not included),

and

- The TCP/IP protocol must be installed in the computer system,
- CD-ROM where the MSS software and manuals (in pdf format) are stored. There are the following manuals: *Installation Manual* and *User's Manual*.

Details of the required software are available at:
http://www.inteco.com.pl/support/Software_requirements.htm

Manuals:

- *Installation Manual*
- *User's Manual*

The experiments and corresponding to them measurements have been conducted by the use of the standard INTECO system. Every new system manufactured and developed by INTECO can be slightly different to the standard. It explains why a user can obtain results that are not identical to these given in the manual.

To use the ML system the following software and hardware components are required:

- Intel or AMD based personal computer
- Microsoft Windows W7/W10
- MATLAB with Simulink and Simulink Coder (not included),
- Compiler (one of listed):

  MS Visual C++ 2017,2019 Community (free for universities).
- The TCP/IP protocol must be installed in the computer OS,
- RT-DAC/USB2 I/O board to communicate with the system
- Inteco MLS2EM set-up
- CD-ROM or pendrive with MLS software and e-manuals: this manual and User's Manual

3. UNPACKING AND CHECKING THE ITEMS

Carefully unpack the items, and remove all packaging and securing material. You should have the following items (Fig. 3.1):

- MagLev main frame with two electromagnets and position sensor,
- Ferromagnetic balls (3),
- Regulation screw with ball table,
- Power interface,
- Emergency switch,
- Two 1 x 40-way ribbon cables for digital and analog signals,
- CD-ROM or pendrive (Documentation: *MLS2EM User's Manual*, this manual, software),
- RT-DAC/USB2/ML card with power supply and USB A-B cable,
- Item List.

The exact specification you will find on the *Item List*. If any item is missing or damaged please, contact *Inteco*.

⇨ **Carefully follow the installation steps described below. Only correct installation procedure ensures proper operation of the system**

Fig 3.1 Components of the MagLev system (MLS2EM), not assembled

4. ASSEMBLY OF THE MECHANICAL CONSTRUCTION AND POWER INTERFACE

The mechanical part of the MagLev system is delivered fully assembled. One needs only to connect Mechanical Unit, Emergency switch to Power Interface and Power Interface to PC via RTDAC/USB2 board. In Fig. 4.1 the connections (black cables) are shown. In Fig. 4.2 the appropriate connections to Mechanical Unit are shown. There are also visible analog (denoted by A) and digital (denoted by D) ribbon cables. These ribbon flat cables go to the RTDAC/USB2 analog and digital connectors respectively.

Fig. 4.1 Power Interface connections

Fig. 4.2 Mechanical Unit connections

5. RT-DAC CARD INSTALLATION

The RT-DAC/USB2 setup contains:

- RT-DAC/USB2 board,
- USB cable
- 9V-12V DC / 4W stabilized power supply. The plug dimensions are given in Fig. 5.2.

The layout of the RT-DAC/USB2 board is presented in Fig. 5.1

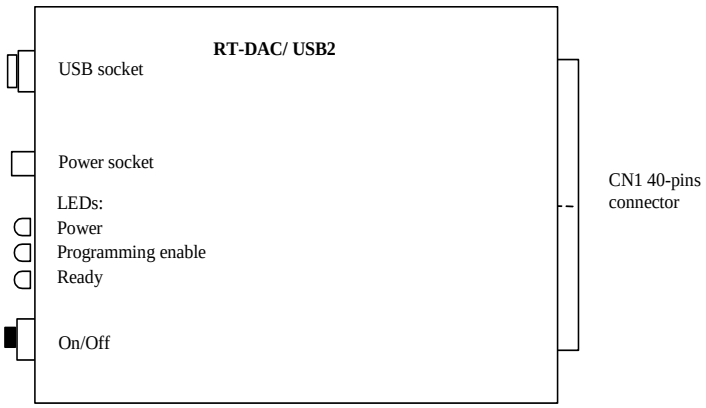


Fig. 5.1. The layout of the RT-DAC/USB2 board

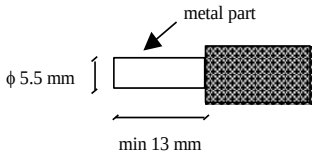


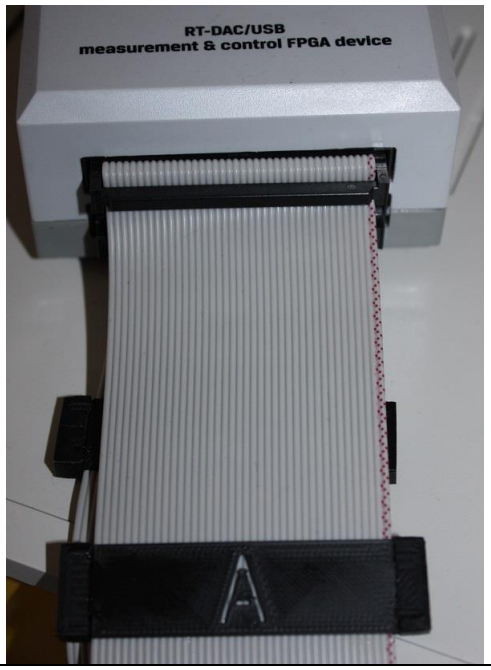
Fig. 5.2. The plug of the DC power supply

The *Power* signalling LED is emitting light when the *On/Off* switch is on, *Ready* LED indicates that communication between RT-DAC/USB2 board and computer is running and *Programming Enable* LED is emitting light when the board is ready to be programmed.

To install the board:

- install driver for the board (see below or CD:\DRIVER\readme*.txt),
- connect the board to the computer using the included USB cable,
- connect the local version of the DC 9V-12V stabilised power supply (not included). 9V DC voltage is recommended.

Next step is connecting the cables to the RTDAC/USB2 board and MLS Power Interface (Fig.5.3).



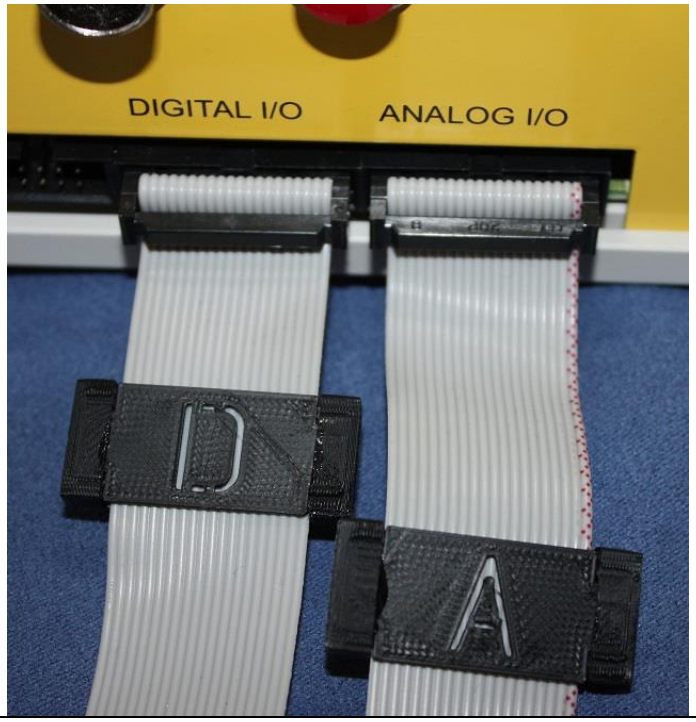


Fig. 5.3. Connecting RTDAC/USB2 and MLS Power Interface

6. DRIVER INSTALLATION

The driver for RTDAC/USB2 board has to be installed. The driver must be installed with administrator privileges.

Windows W7/W10 installation

1. Open Device Manager
2. Connect the RTDAC/USB device and turn power ON
3. System detects an “Unknown device”. With right key of mouse
4. go to Properties/Update Driver/Browse my computer...,
5. select path CD:\driver\directory_related_to_your_OS\cyusb.inf
6. click OK

7. SOFTWARE INSTALLATION

The system administrator, who has full access to all drivers and system settings, must start the application.

To start the installation program insert the CD-ROM into the drive, and run *manager.exe* placed in the main directory. From the INTECO Software Manager application window, select MagLev Toolbox Installation. You will see the window (Fig. 7.1).

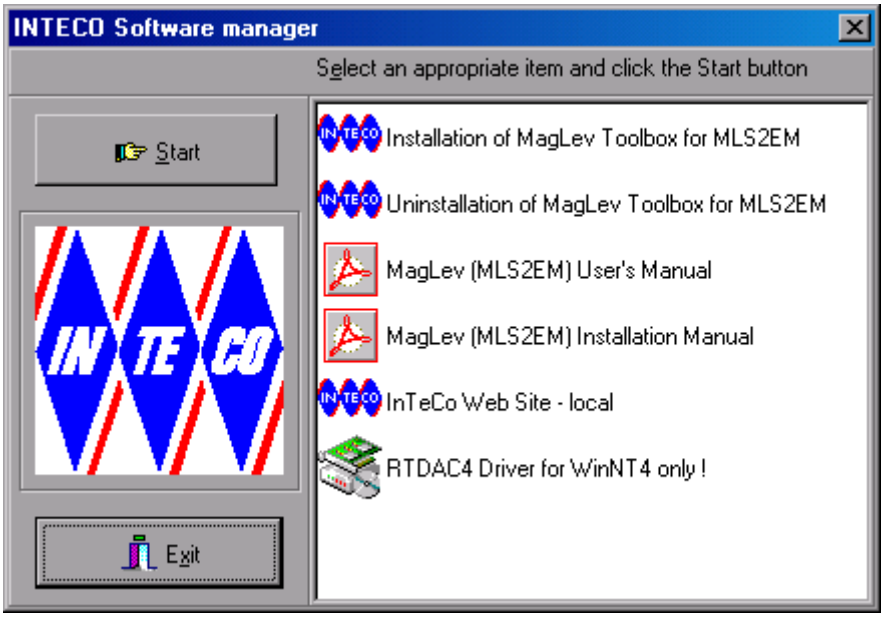


Fig. 7.1

Click the *START* button to start the installation program, or *EXIT* to quit.

If you select the *START* option you will see the license information. Read the license agreement carefully. If you accept the license terms mark the checkbox and click the *Next* button.

The window that follows asks you for your name and the name of your company (Fig.7.2).

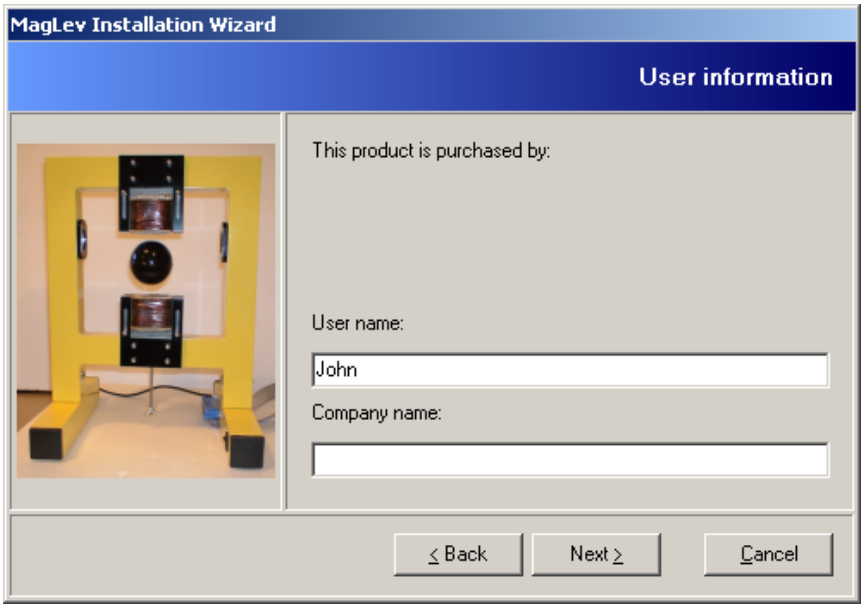


Fig.7.2

If you click the *Next* you will see an important dialogue window containing your current MATLAB settings (Fig. 7.3). You will be informed about the version of your Windows system.

You must select the appropriate version of the MATLAB software installed. Next, point out the folder of the *matlab.exe* file that is located in the BIN directory. For this purpose click the *Browse* button.

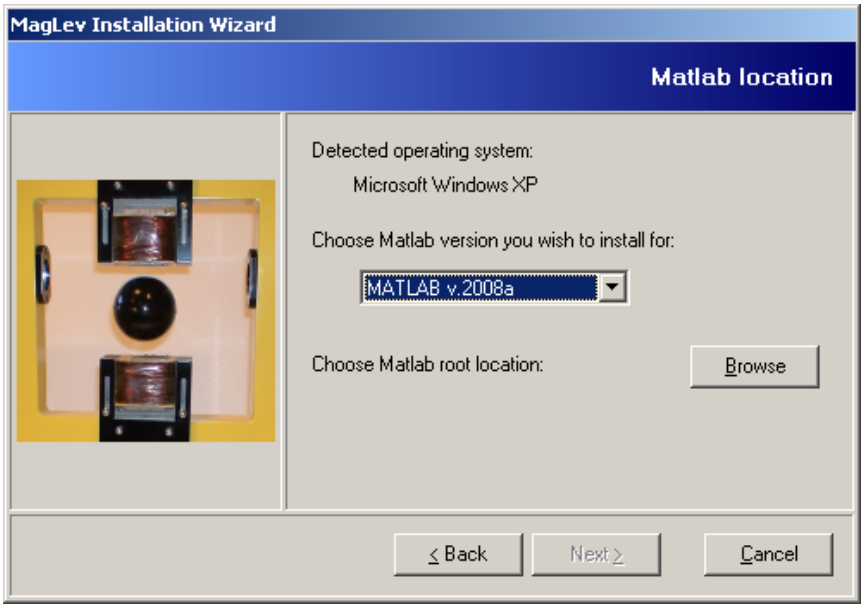


Fig. 7.3

Browse your system directories and select the appropriate directory. The program automatically detects the presence of the *matlab.exe* file and closes the

dialogue window. The selected location will be displayed in the *Matlab location* window (Fig.7.4).

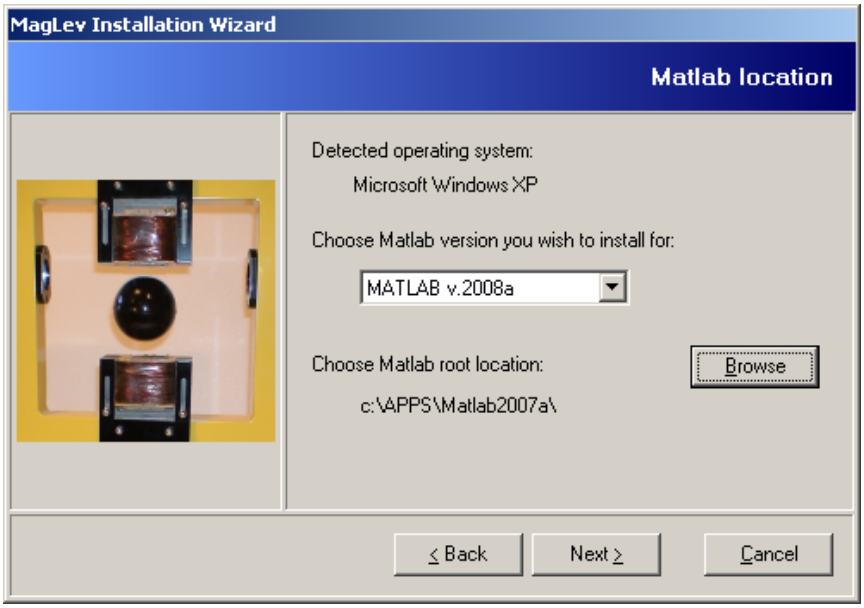


Fig. 7.4

If you have completed installation settings click the *Next* button to start the installation procedure. The end of installation process will be confirmed by the appropriate window (Fig.7.5).

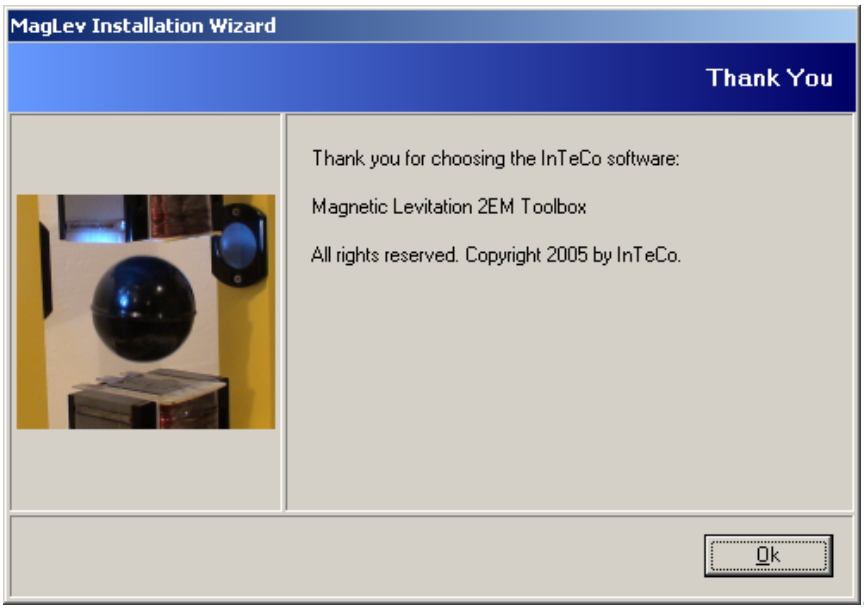


Fig.7.5

To uninstall the software select the appropriate option from the *Software Manager* window.

8. STARTING AND TESTING

In order to test the system perform the following steps:

- Install the MagLev Testing&Control software. For this purpose refer to Section 7.
- Start MATLAB and type the *MLS2EM_usb2_main* command.
- For identification purposes use prepared tools from MagLev Toolbox
- For control purposes use the ready to build real-time models.

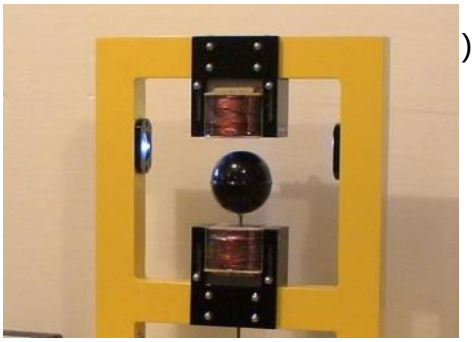
) ) 

Fig.8.1 a) Sensor characteristics identification, b) levitation experiment