GETTING STARTED MOSAIC

6th edition – January 2005

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1. MOSAIC INSTALLATION

Introduction

Mosaic is an integrated development environment for the development and maintenance of the programs for the control systems manufactured by company Teco a.s. Kolín.

PC Requirements

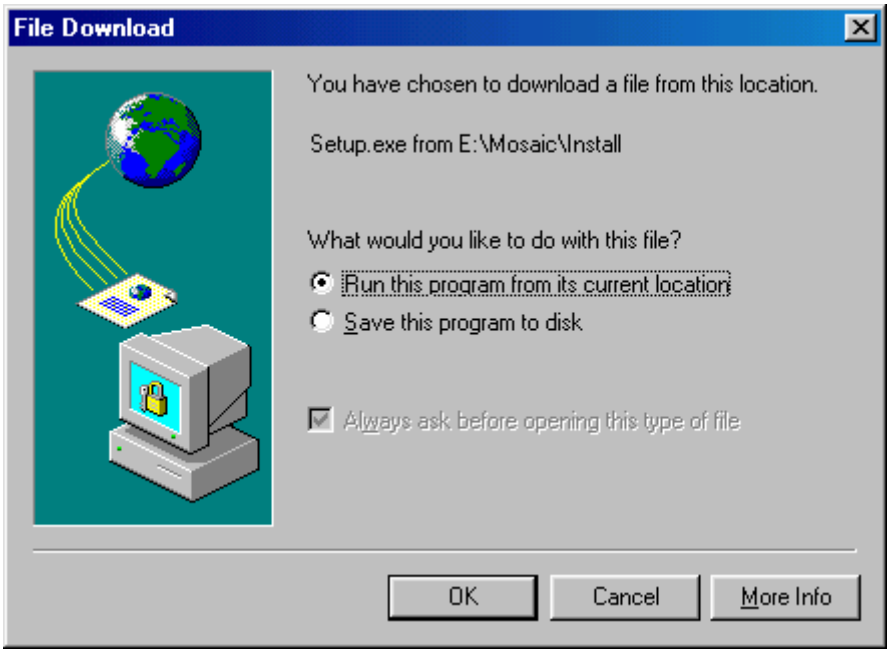
To successfully use the Mosaic development environment, at least the following PC configuration must be available: Celeron 300 MHz processor, 64 MB RAM, 60 MB free space on the hard disk (for full installation including documentation, 21 MB for typical installation), resolution 800x600 high colour, a serial port for communication with PLC, a parallel or PCMCIA or USB port for the hardware key. Operation system MS Windows NT4.0 / 2000 / XP.

Environment installation

It's necessary to be logged as user with administrator's rights before installation!

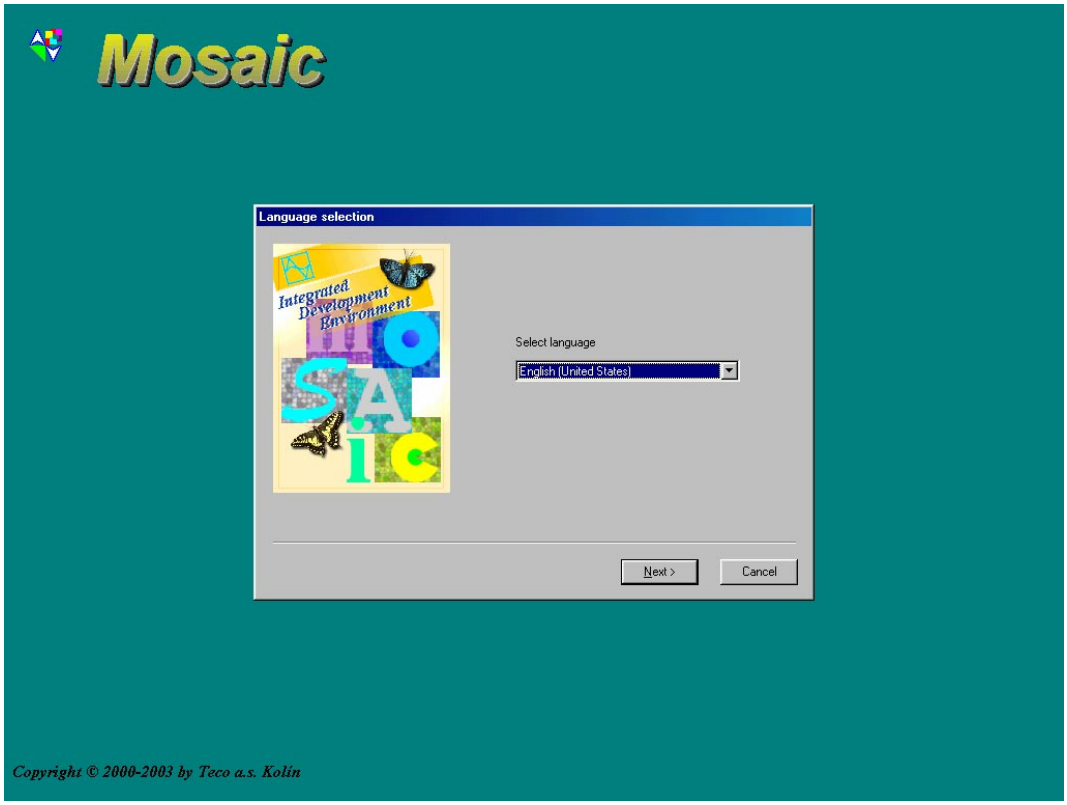
The Mosaic development environment is distributed on a Company Info CD or on an installation CD Mosaic. Its latest version is also available on the website www.tecomat.cz or www.tecomat.com. After the application is installed, the setup.exe program must be run, that you can find on the CD-ROM in the folder *SW* \ *Mosaic* (on the Info CD) or in the folder *Mosaic* \ *Install* (on the Mosaic installation CD). The installation can also be run from an Internet browser after opening the teco.htm file from the CD main directory. If an older version is installed on the hard disk, this version must be uninstalled first and the installation of the new version can be run afterwards.

If we run the installation from the Internet browser, then select the option "Run this program from its current location".

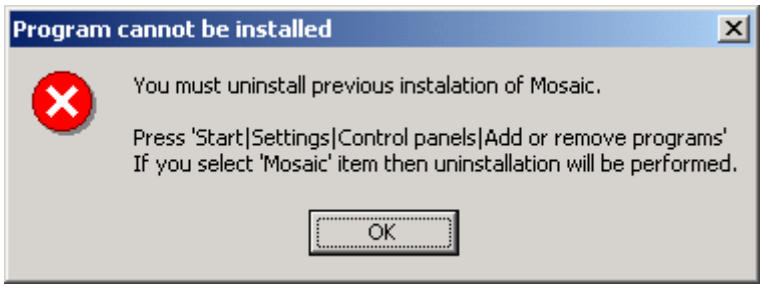


Starting installation

Before installation, it is recommended to quit all running applications. After the installation is started, select the language you require. Fully operational Czech version has been available till now, English, Russian and Polish versions are being prepared.



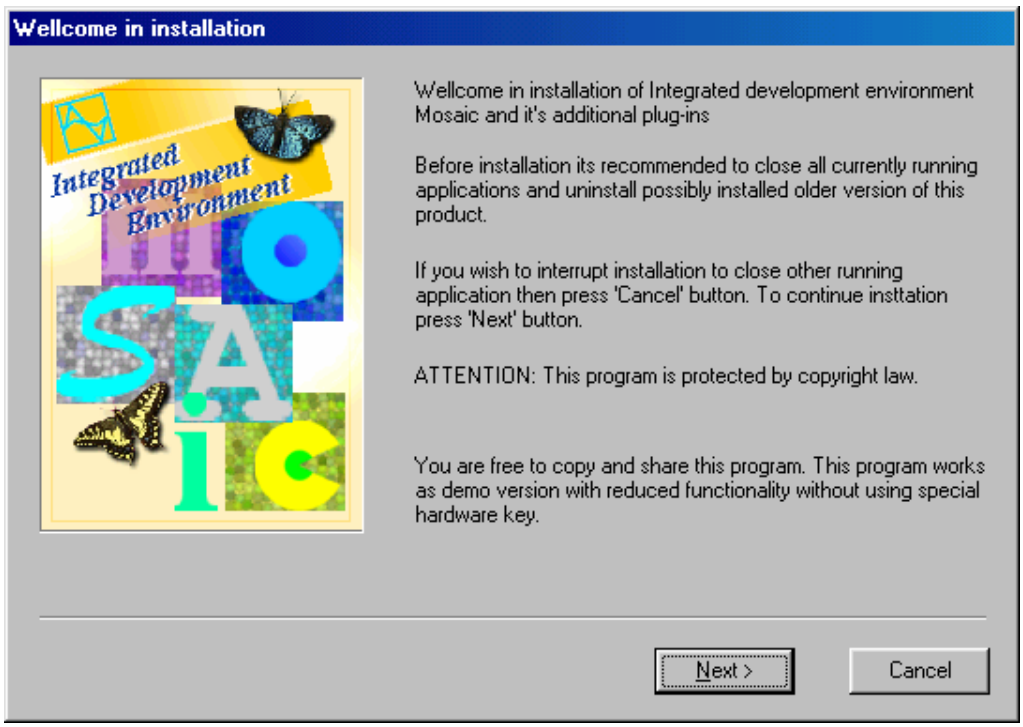
If an older version of the Mosaic development environment is installed on the computer, then this version must be uninstalled first and after that the new version can be installed. In this case, the installation will be terminated and the following message will appear:



Information during installation

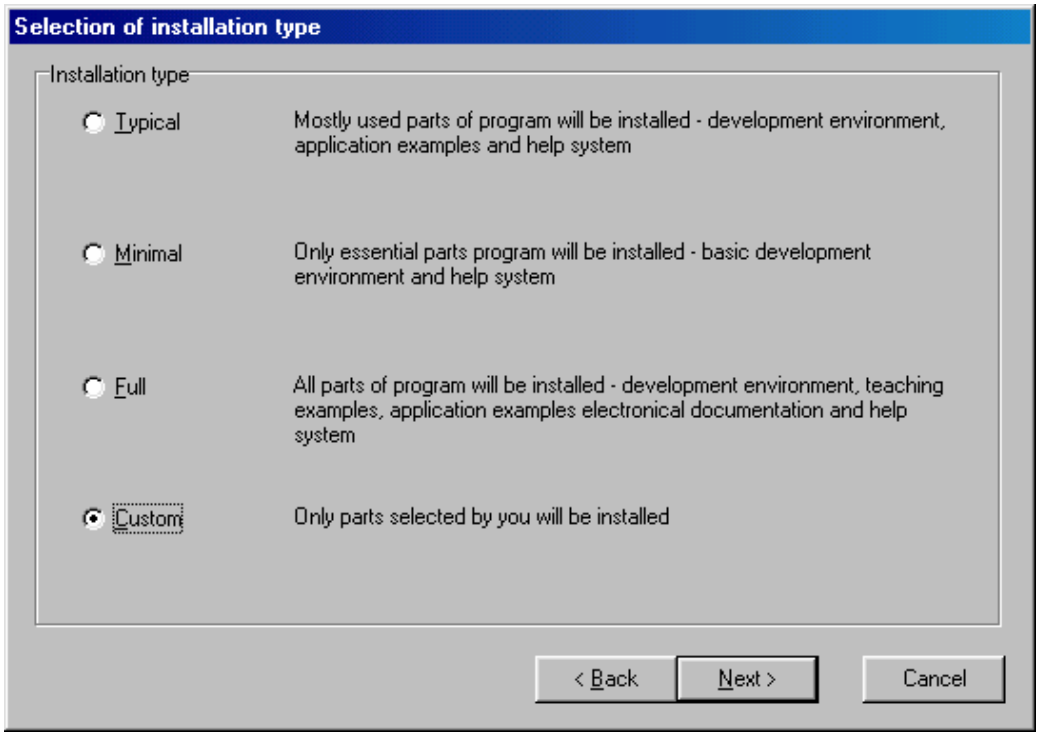
If there is no old version installed, the installation will continue with displaying introductory information, after clicking the *Next* button.

Each step of installation has a dialog box containing a detailed description of the progress of installation. By means of the *Back* button, you can return to any previous step at any time. The installation can be cancel by pressing the *Cancel* button.



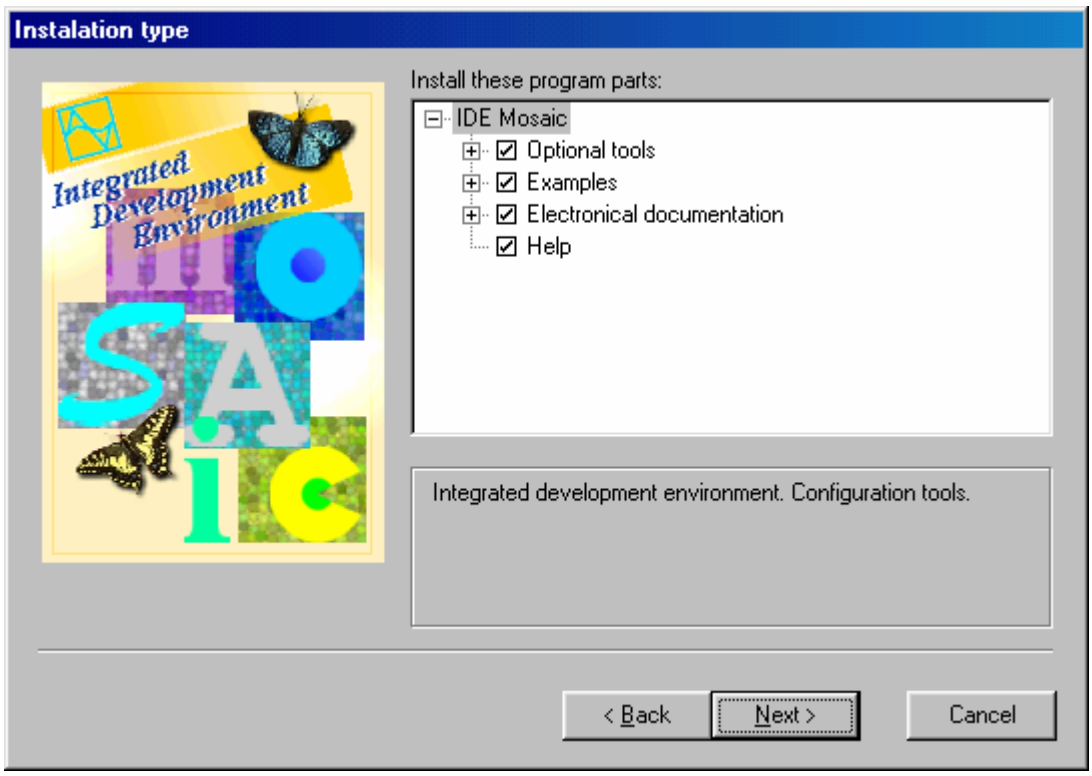
Installation type selection

After pressing the *Next* the installation will continue and licence conditions will be displayed. The following window then allows selecting one of the four types of installation:



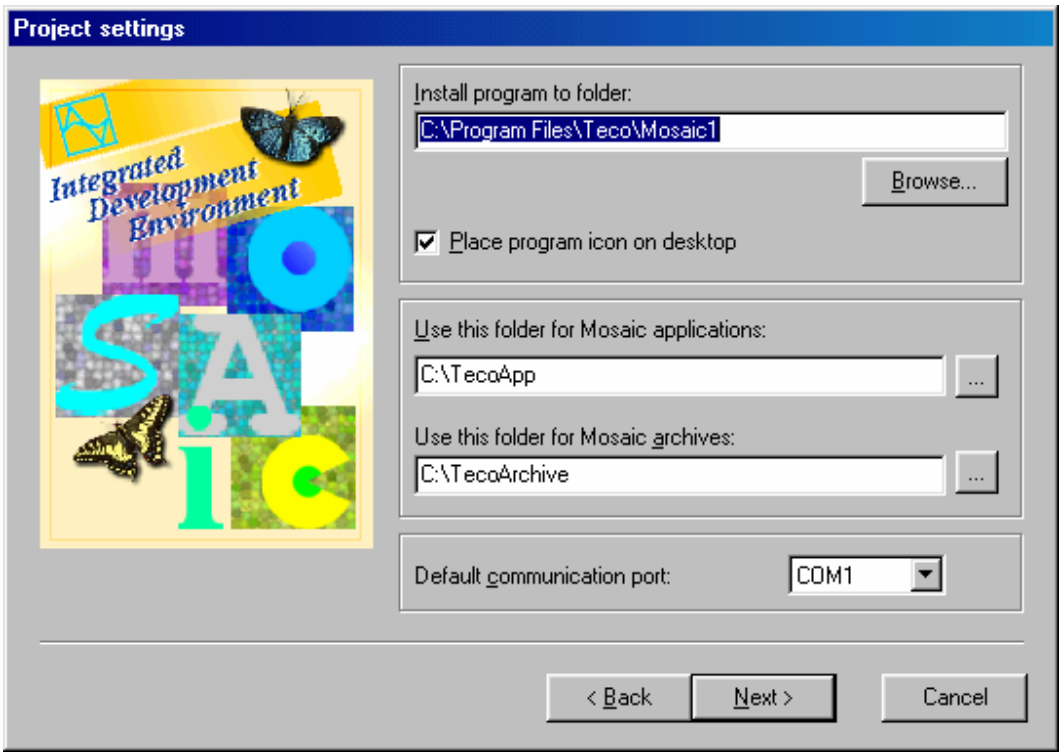
Installation control

When selecting the customized installation, it is possible to select, which parts of the Mosaic development environment will be installed and to which folder the program will be installed.



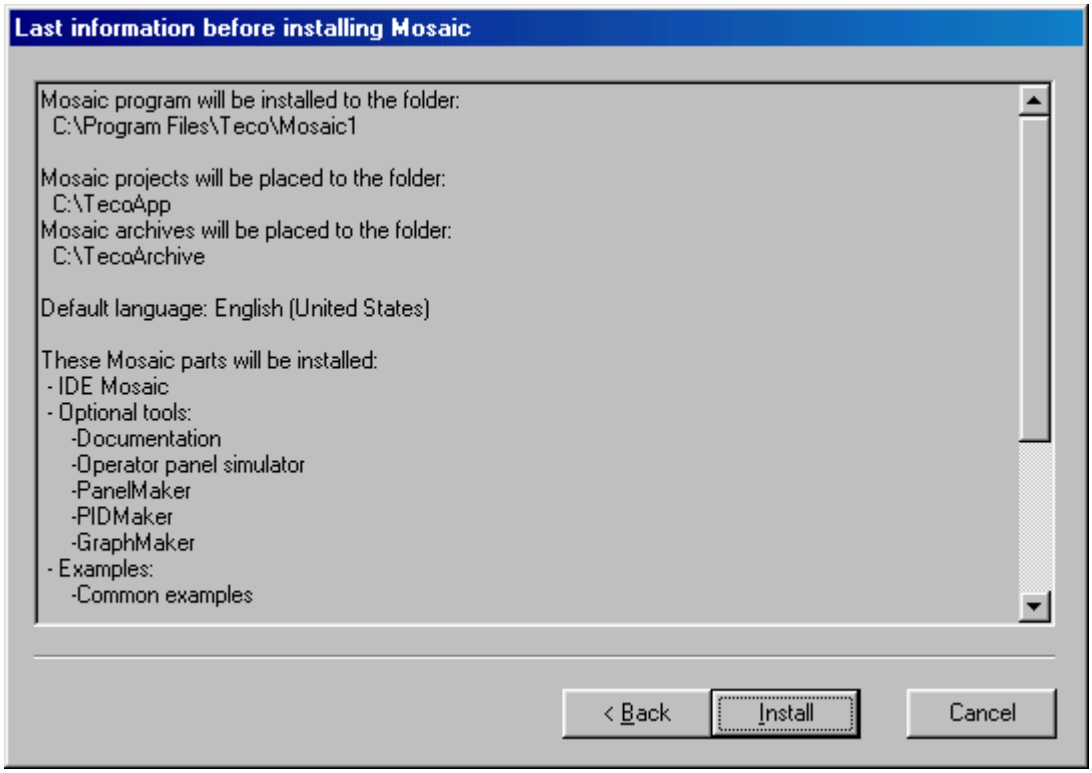
Folder setting

The next window allows selecting a folder to which the program will be installed and a folder where the Mosaic projects will be saved. This is the folder where all data is saved when working with Mosaic (program source texts for PLC, compiled files, etc.). The initial port can be selected, too. This port will then be offered as the first one when connecting a real PLC.



Information before starting installation

The last window before the installation itself allows checking the parameters being set. By means of the *Back* button, you can return to the previous selections and make a correction if necessary.



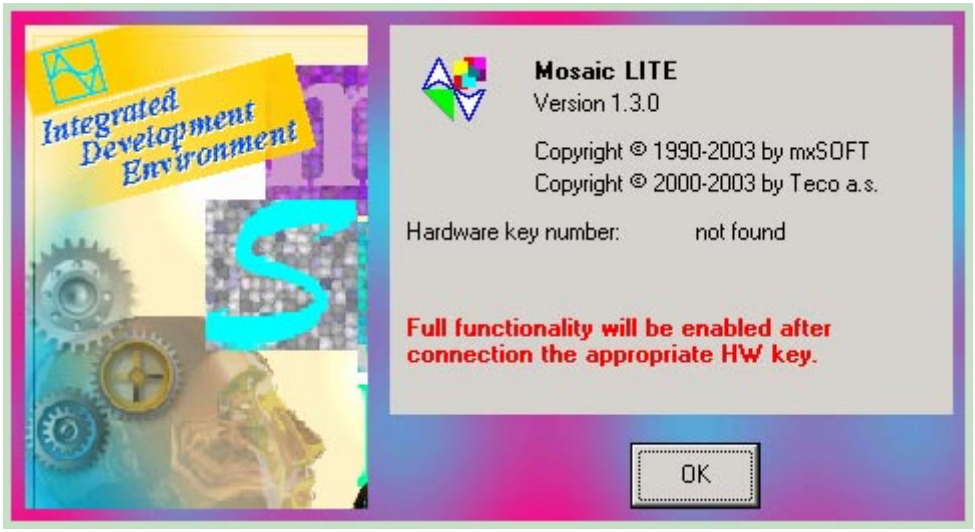
The installation itself starts by pressing the *Install* button. The progress of installation is displayed in a separate window. After the installation is finished, a message with the result of installation will be displayed.

2. HARDLOCK INSTALLATION

The full functionability of the Mosaic development environment is conditional on a hardlock. A hardlock for the parallel port, USB or PCMCIA interface can be used.

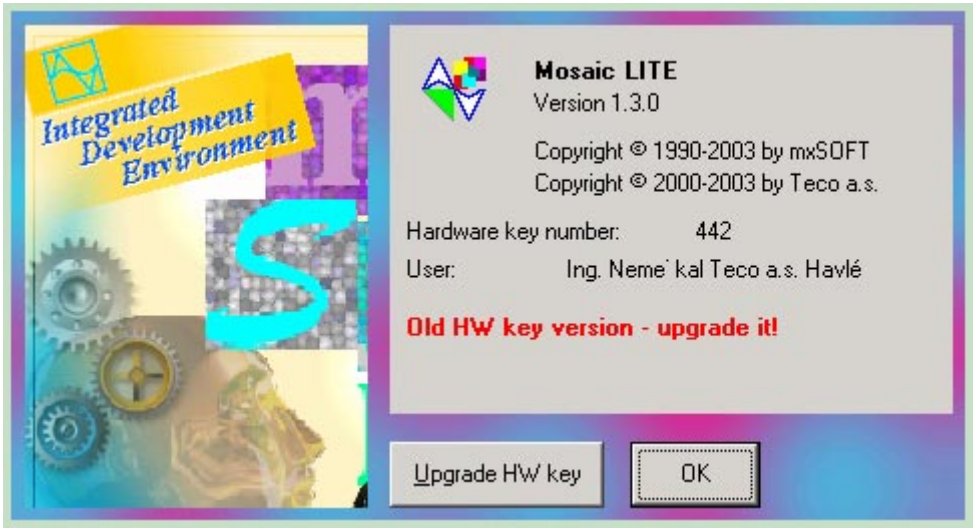
Mosaic without a hardlock

If the hardlock is not found during environment start, the application will run in a restricted version (Lite). In this case, the Mosaic development environment can be used for programming such PLC assemblies, where only 2 directives *#unit* are enough to be used in the program for the PLC. This concerns especially the smallest control systems.



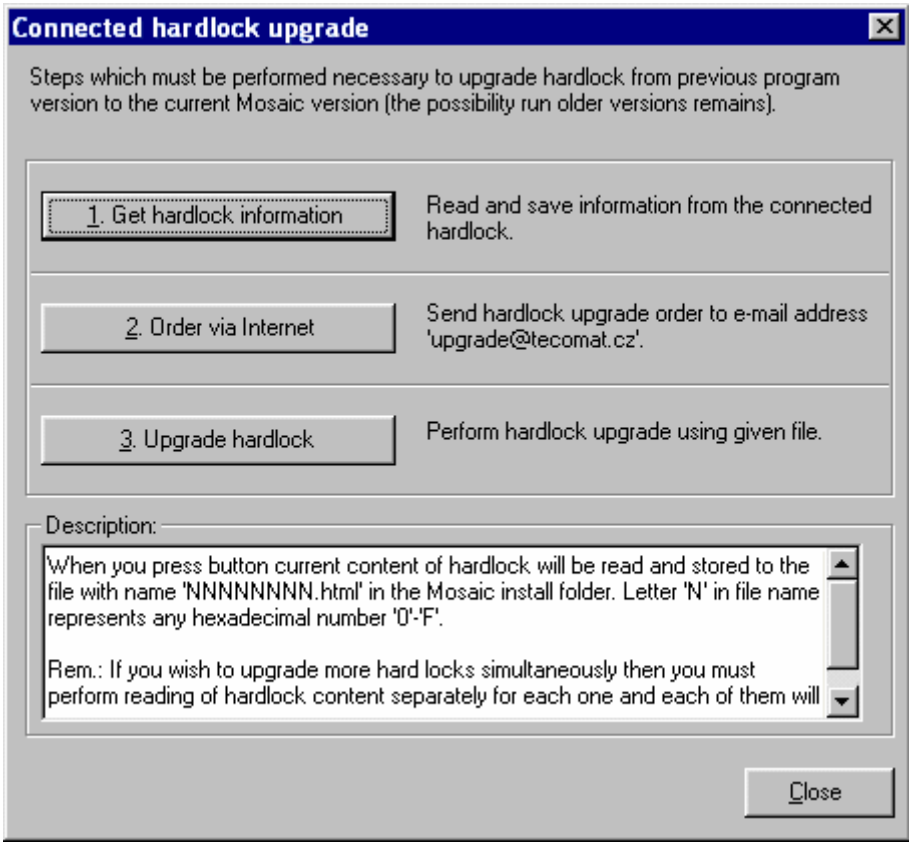
xPRO hardlock detection

The xPRO v3.0 environment users can use the possibility of upgrade of the xPRO hardlock to the Mosaic development environment hardlock. If a hardlock for xPRO is found when launching the Mosaic development environment, Mosaic offers a dialog box for hardlock upgrade. The dialog box is available any time in menu *Tools | Upgrade hardlock.*



Upgrade of xPRO hardlock for Mosaic

By selecting the button *Upgrade hardlock* a dialog window appears allowing to modify the xPRO hardlock for the Mosaic development environment. If you press the *OK* button, Mosaic will run in the Lite version (thus the same way, as if no hardlock was found).



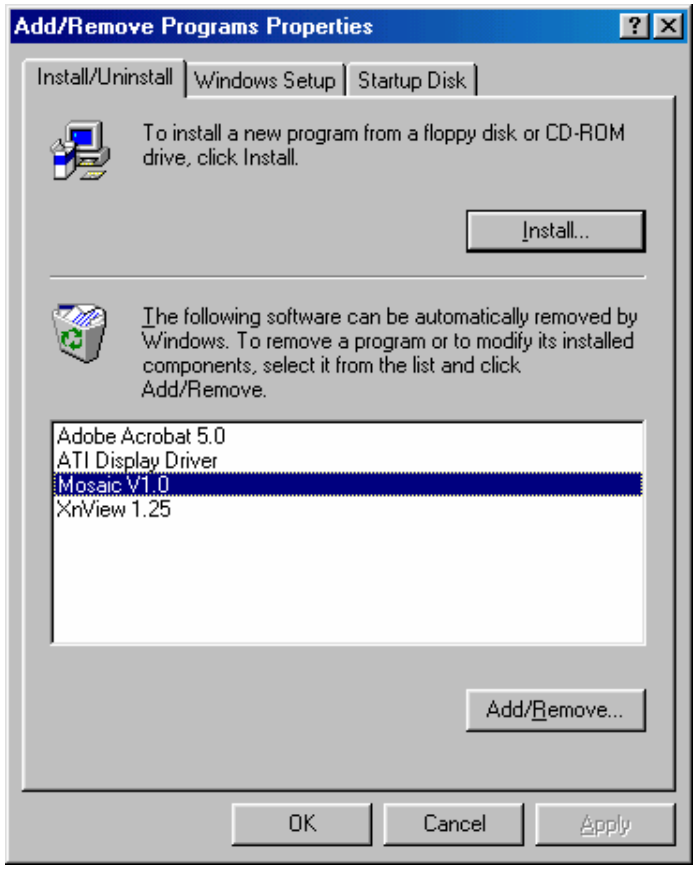
First of all, it is necessary to obtain information on the hardlock by pressing the corresponding button in the dialog box. The information on the hardlock can be found in the text file, the name of which is in the window *Description* ("FA41FE46.txt", for example). This file together with user´s information is sent to upgrade@tecomat.cz. This is done automatically after pressing the button *Order via Internet*.

The Teco company processes this file and send a new one to the user, which will be used for hardlock upgrade. The upgrade is subject to charge. After the hardlock is upgraded, it can be used for both Mosaic and xPRO applications. The information on the Mosaic version used including hardlock type can be obtained from the menu *Help | About Mosaic*.

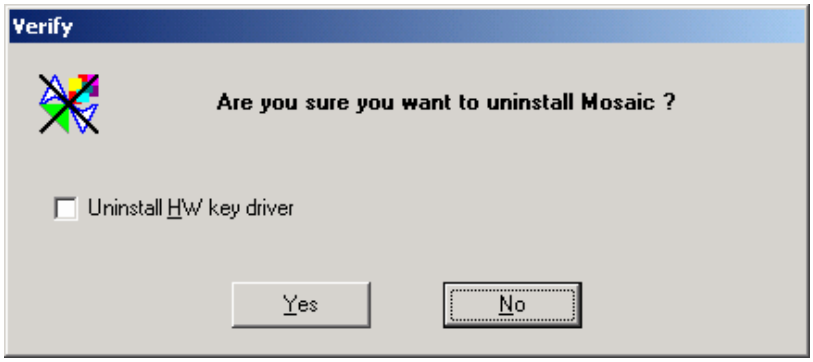
3. MOSAIC UNINSTALL

Mosaic environment uninstall

To uninstall the Mosaic development environment, standard means of the Windows operation system are used to remove the program from the computer. The selection *Control panel | Add or remove programs* displays a menu as you can see on the following figure, as an example (Windows 98).



To uninstall the program from computer memory, Mosaic is selected and by pressing the button *Add or remove,* the uninstall process will start. Further, the following dialog window must be confirmed.



The files having been saved in the application directory when working with Mosaic (standardly c:\TecoApp) will remain on the disk after the Mosaic development environment has been uninstalled. This means the data created for particular applications will be kept on the disk (program source files, PLC configuration, etc.).

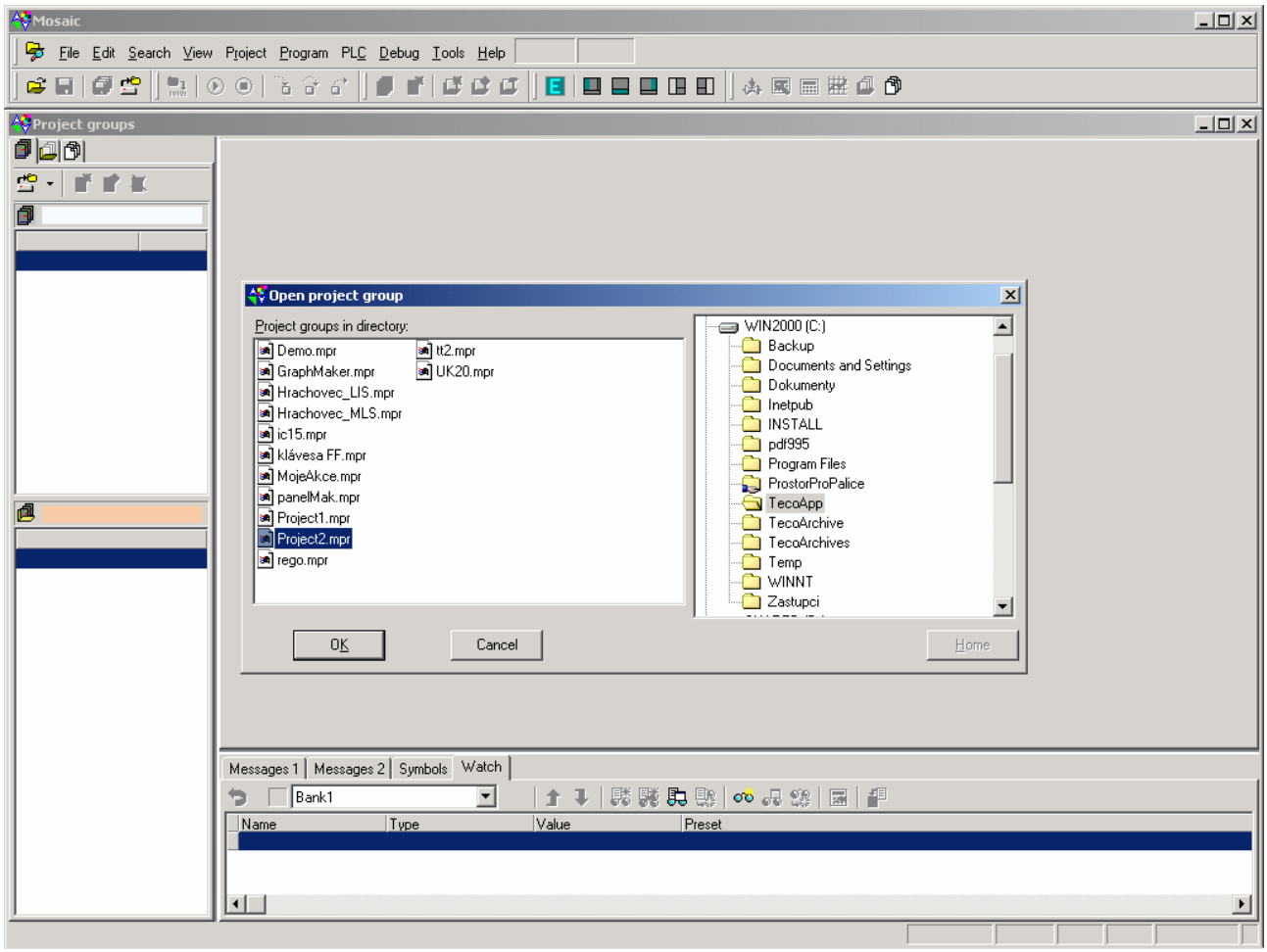
4. CREATING A NEW PROJECT

The integrated Mosaic development environment comprises a great number of tools for creation and debugging of the programs for the control systems manufactured by company Teco a.s. The programs for the control systems comprise of files, some of the files are created automatically as the result of a specialized toll being used and some files are created by the programmer.

All programs for the PLC in the Mosaic development environment must be part of a project group. This group can contain one or more projects for particular control systems. Each project contains all files and information necessary to program one control system.

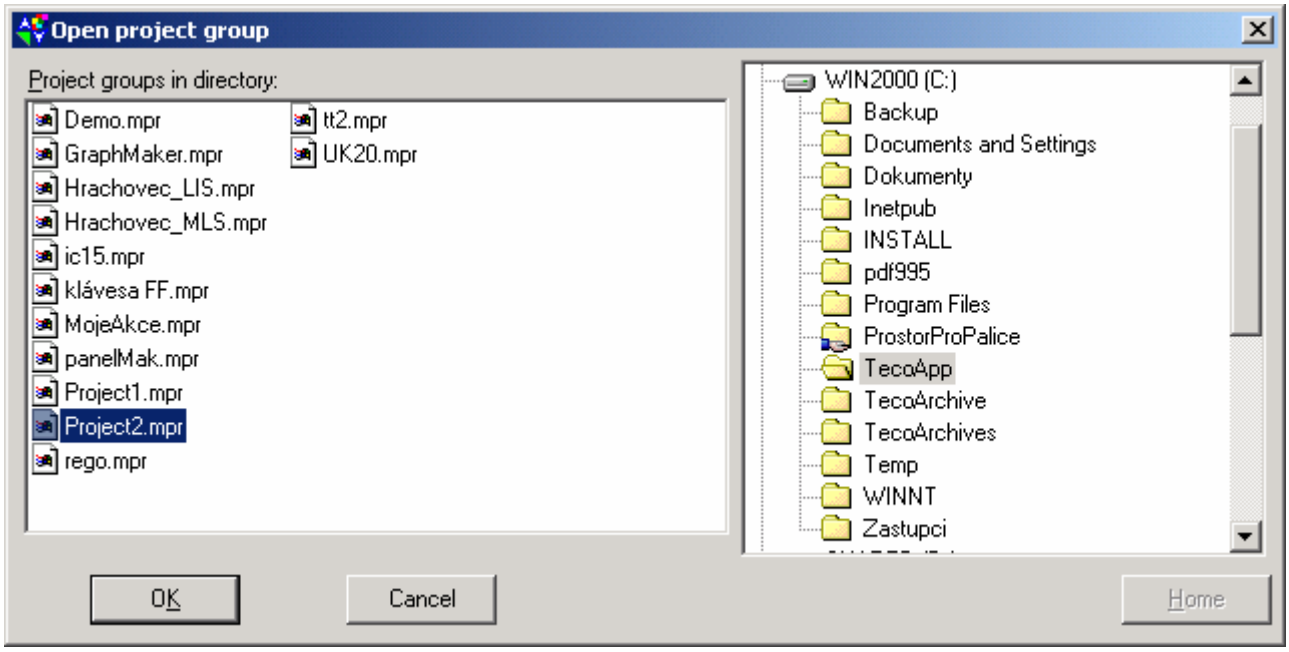
Launching Mosaic

The following text describes how to create a new project, in which a program for one particular PLC system will be contained. After launching the Mosaic development environment, the following windows will be displayed on the screen:



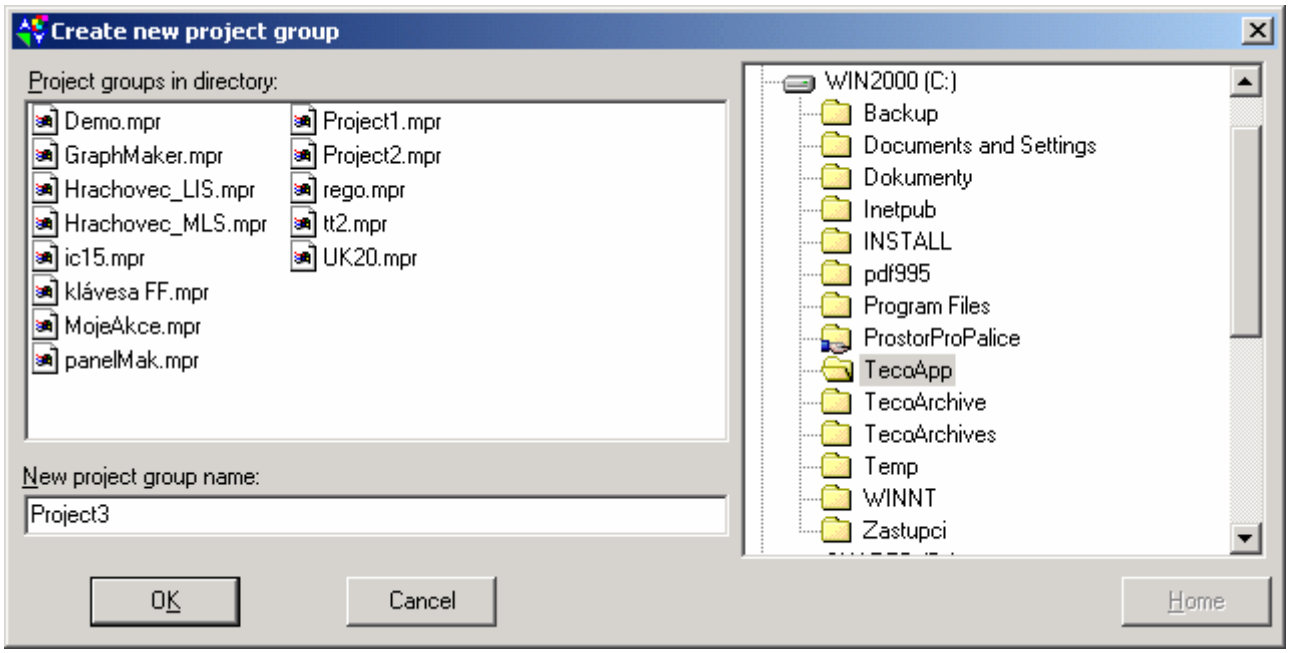
Dialog to open a project group

The initial dialog allows opening existing (already created) project groups. The existing project groups are represented by files with extension ".mpr" (**M**osaic **Pr**ojects). For new project group creation, press *Cancel* button and choose *Project* | *New project group* from menu.



Creating a new project group

After choosing *Project* | *New project group* from menu the following dialog window is displayed:

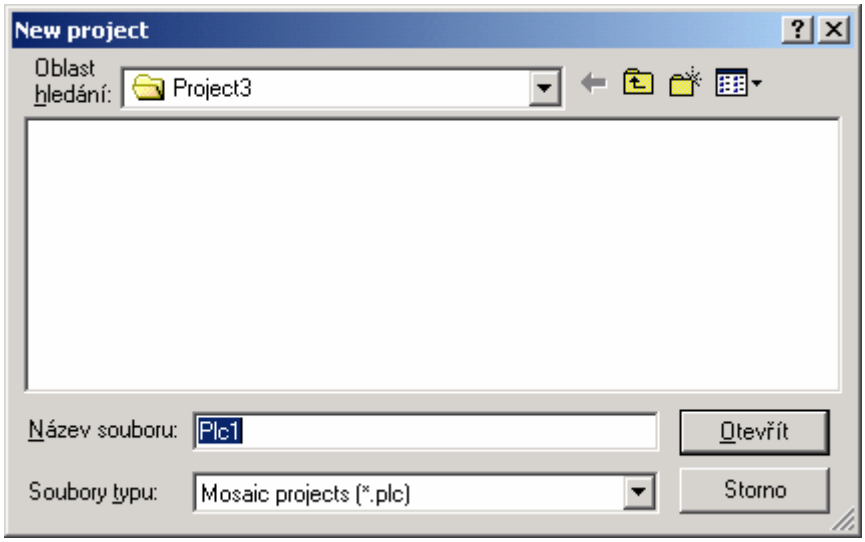


For the new project creation, it is necessary to enter a name of the new project group in the field *File name*. In this case, a name of "Project3" has been used.

Then press *OK* button, a directory with the name of "Project3" is created and a new file containing information on the created project group. The name of the file will be "Project3.mpr".

Add a new project

In the next dialog window, it is necessary to enter a name of the project within the group. The project will then contain all necessary information to program one control system. The name of the project can be arbitrary. The same name will be used also for the created program for the control systems.



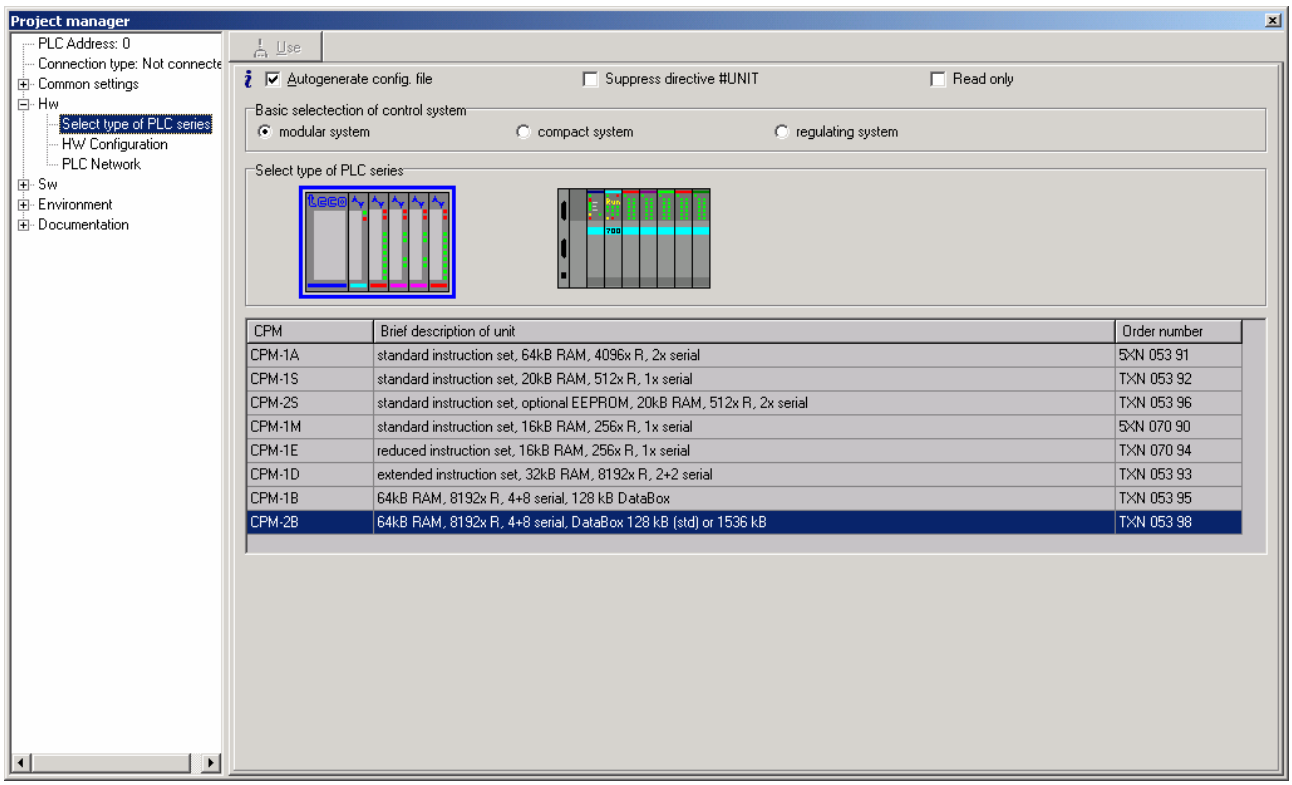
In this case, the name of "Plc1" has been chosen, so the directory "Plc1" will be created and it will contain the following files that will be created automatically:

Plc1.plc	file for project manager
Plc1.mak	file for compilation control
Plc1.mos	basic source file for the project group
Plc1.sym	file for symbolic names (spare)
Plc1.prg	file containing information on debugging
Plc1.dsk	file for desktop
Plc1.hwcx	file of the tool for PLC configuration
Plc1.hwc	source file generated by the tool for PLC configuration

For project group write, file Plc1.mos (**Mo**saic **S**ource) is used.
The other files are generated by the particular tools in the Mosaic development environment and their modifications are not recommended.

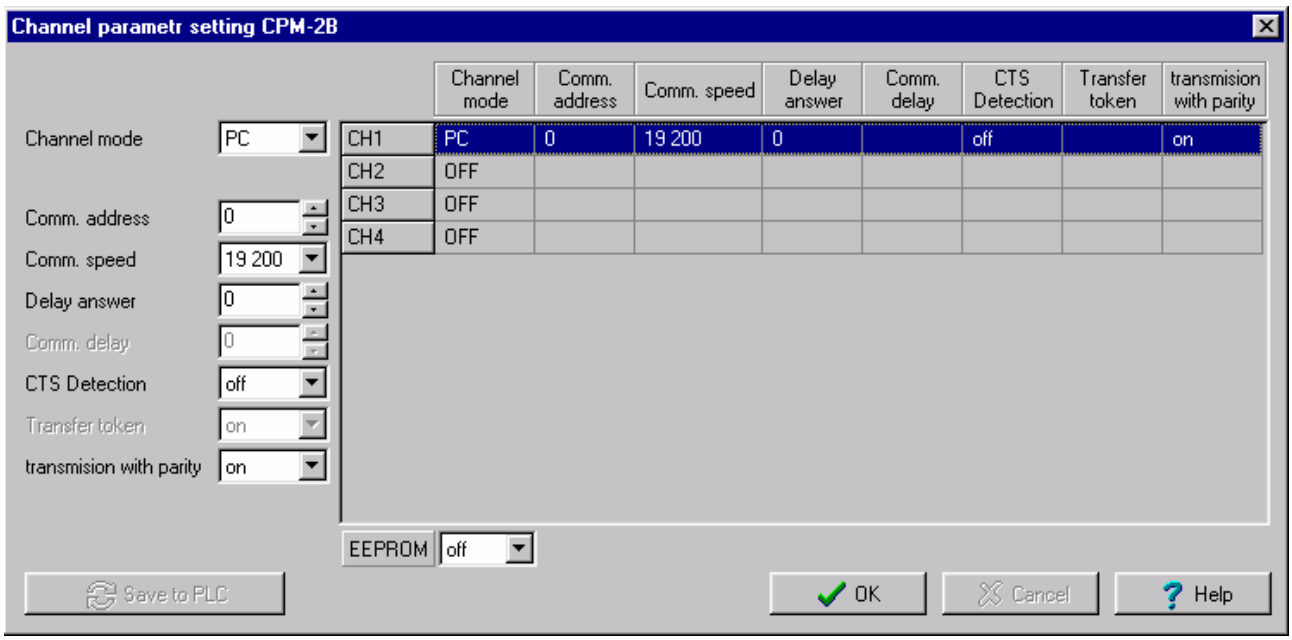
Control system type selection

The next dialog window allows the selection of control system type. If we select a modular PLC of NS950 series, then we can select the type of central unit. In case of compact and control systems, the type of the central unit is set automatically.



Serial channel setting

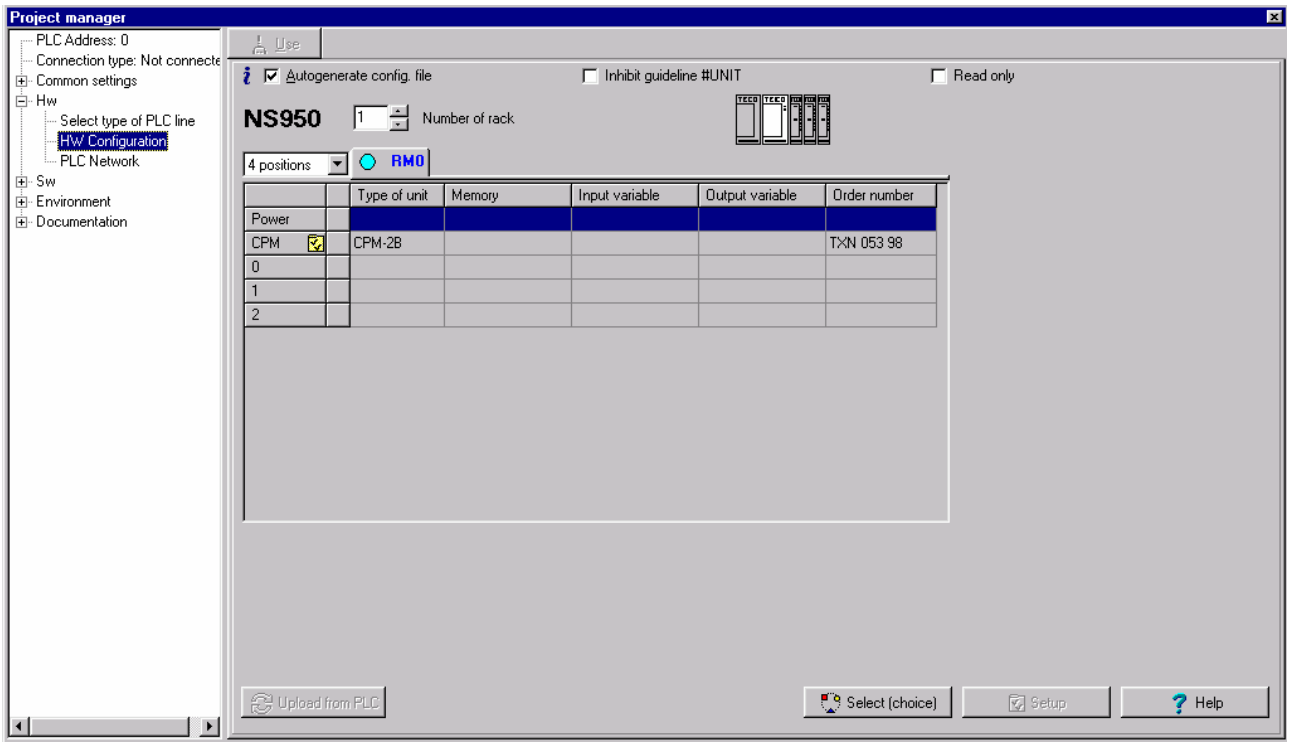
By clicking on the selected (blue-framed) figure of the system having been selected, another dialog window will appear. This window allows to set the parameters for the serial channels on the control system central unit.



PLC HW configuration

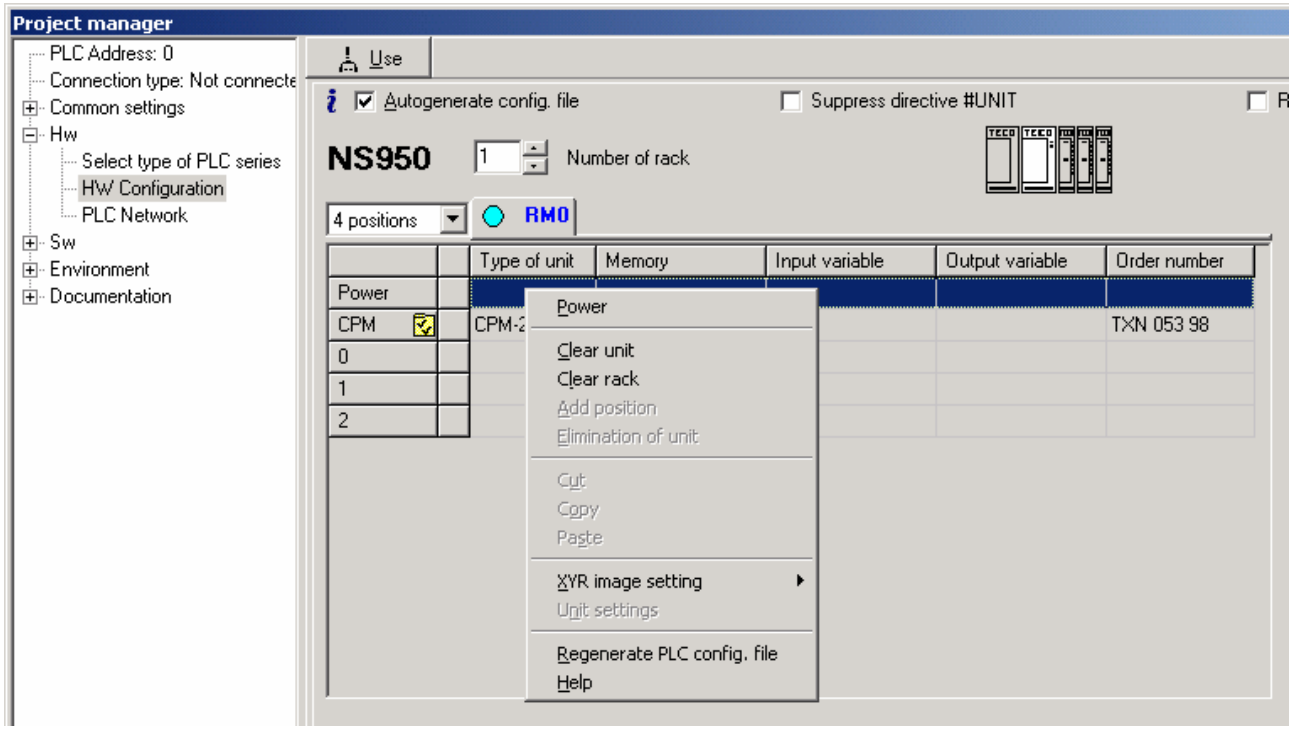
After the serial channels are set, a next dialog window will appear, that allows to carry out PLC configuration. Here you can specify, how the PLC assembly will look like. In this concrete case, it is possible to specify the number of PLC racks for NS950, into which the peripheral units will be fitted and the number of positions in each rack. For each rack, you can specify the source type, central or expansion unit type and the types of all peripheral

units forming the PLC assembly. If the option *Autogenerate config. file* is enabled, then the file with PLC HW configuration will be created or modified with each change (in this case it will be the Plc1.hwc file). This file contains the *#unit* declarations for all peripheral units being specified. The option Suppress *#UNIT* directive allows to "switch off the units" and keep all other declarations of HW configuration, so that it is possible to debug the program without peripheral units. The option *Read only* allows to lock a dialog window already set, so that it is not possible to make any more modifications in it.



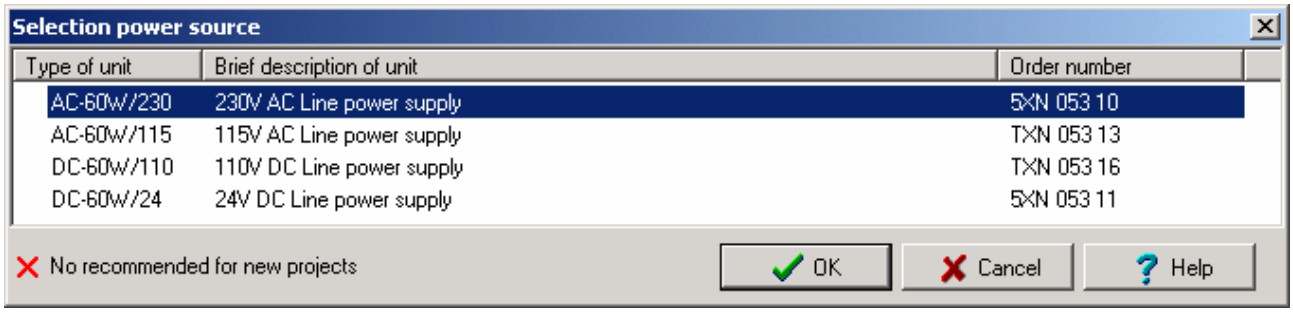
Local menu for HW configuration

By clicking with the mouse on a position not yet filled in the form for the PLC rack, an auxiliary menu will appear. From this menu, you can select a group of peripheral units, from which you can further select a concrete unit for the particular position.



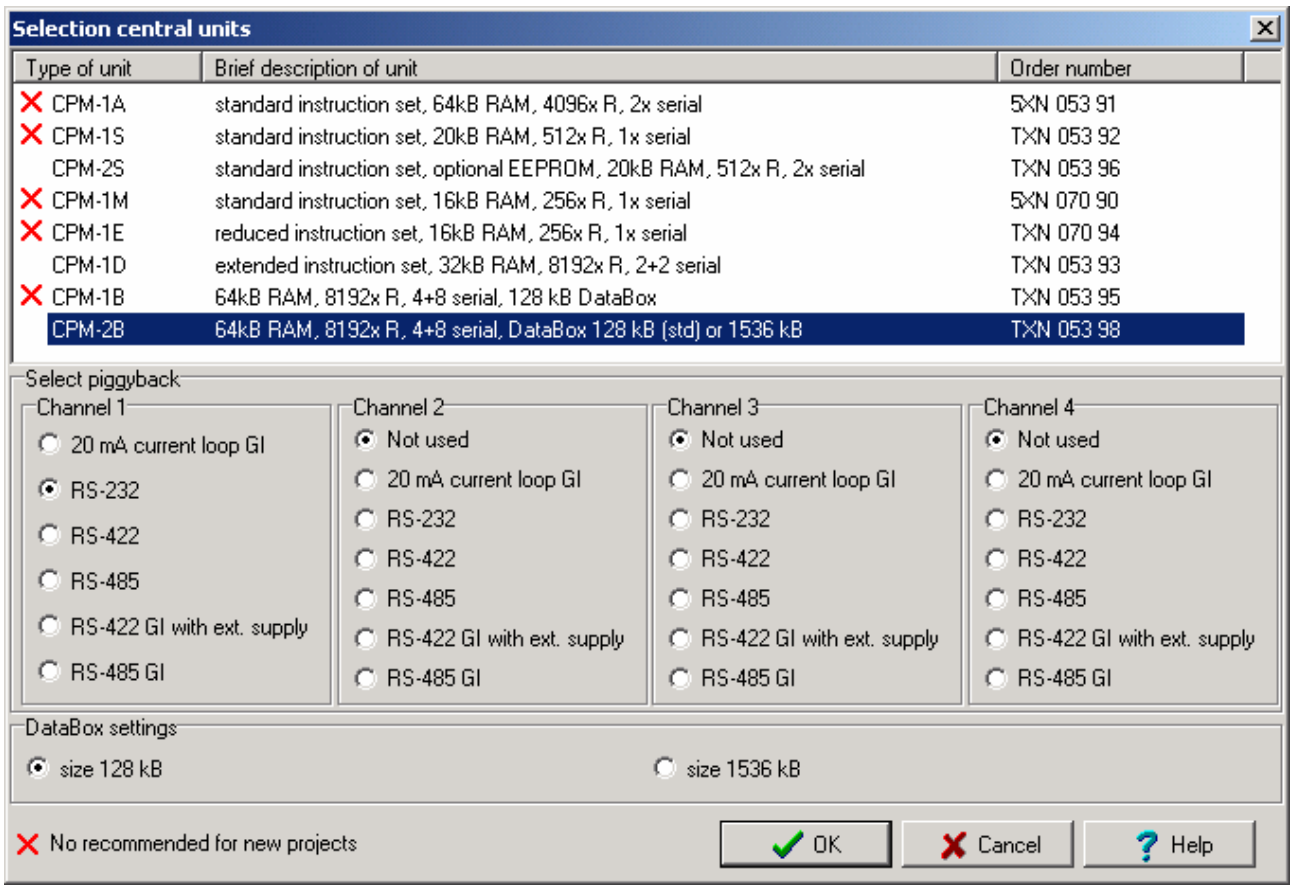
PLC source type selection

When you double-click the highlighted row, a menu will appear, from which you can add a unit to the particular position in the rack. From the following dialog window, you can select a PLC source type.



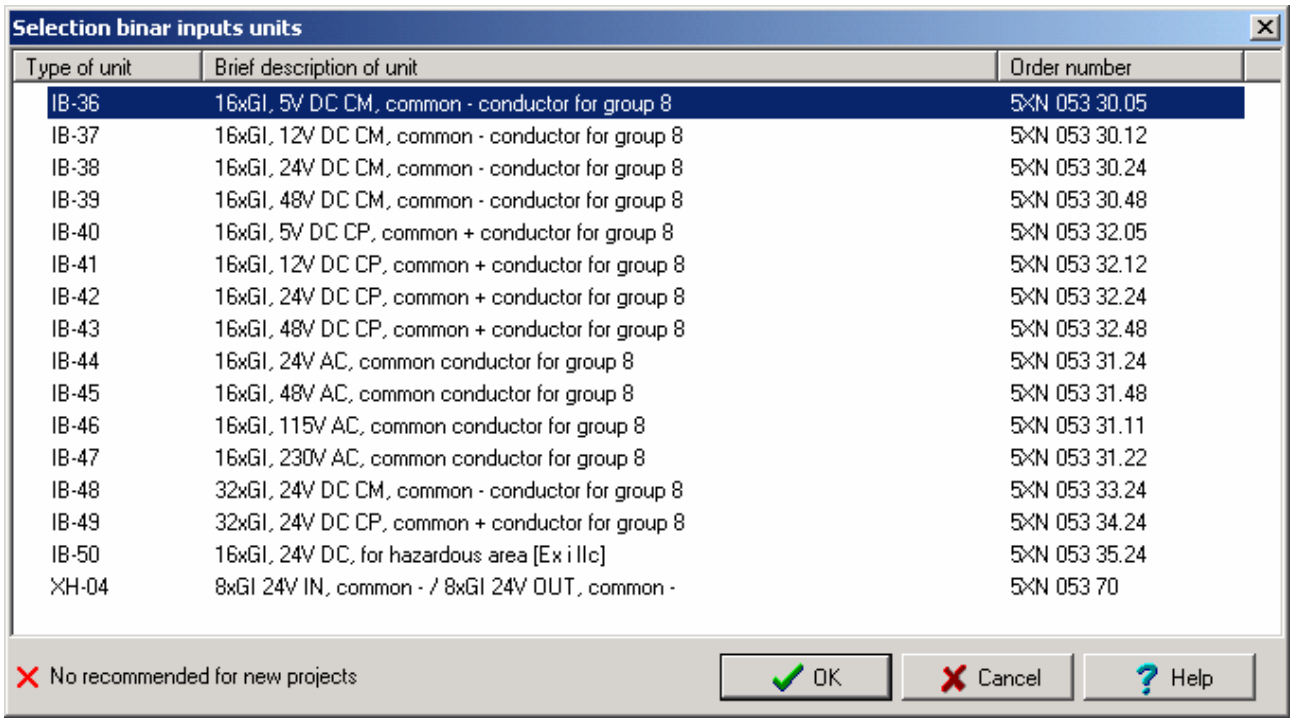
PLC central unit selection

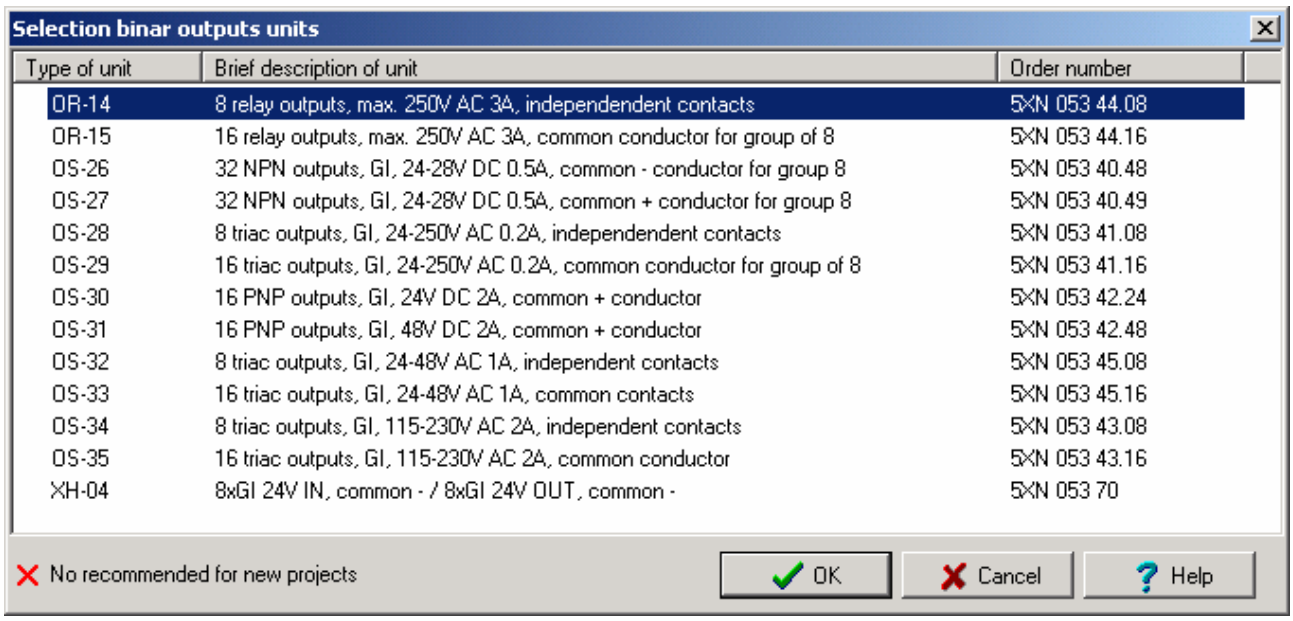
By clicking a row with the central unit, a dialog window will appear allowing you to set a CPU type. In this dialog window, you can further select, how the communication interface for the serial channels will be fitted and the size of the DataBox used.



Input unit selection

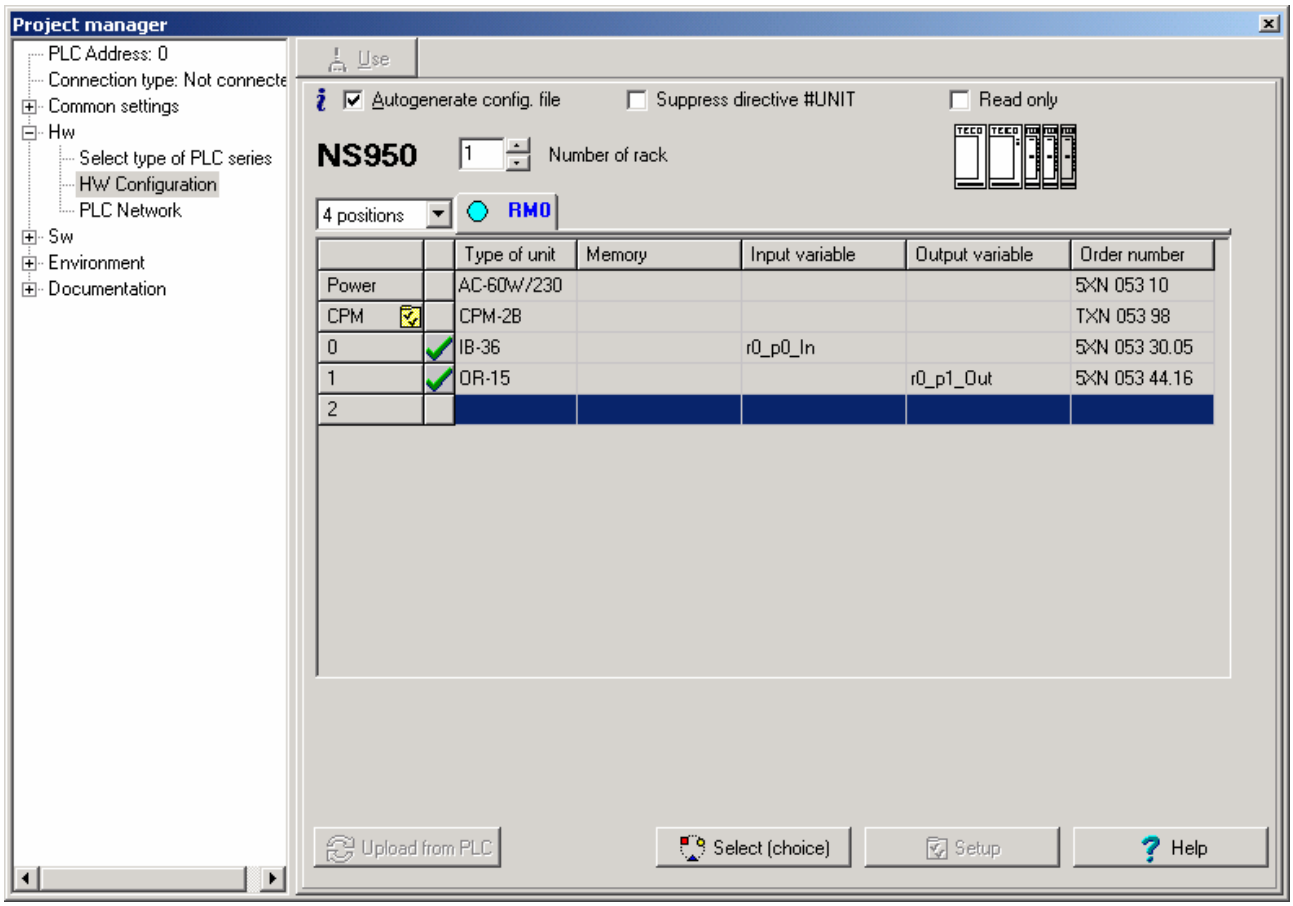
The dialogs for the selection of the unit of binary inputs or outputs look as follows:





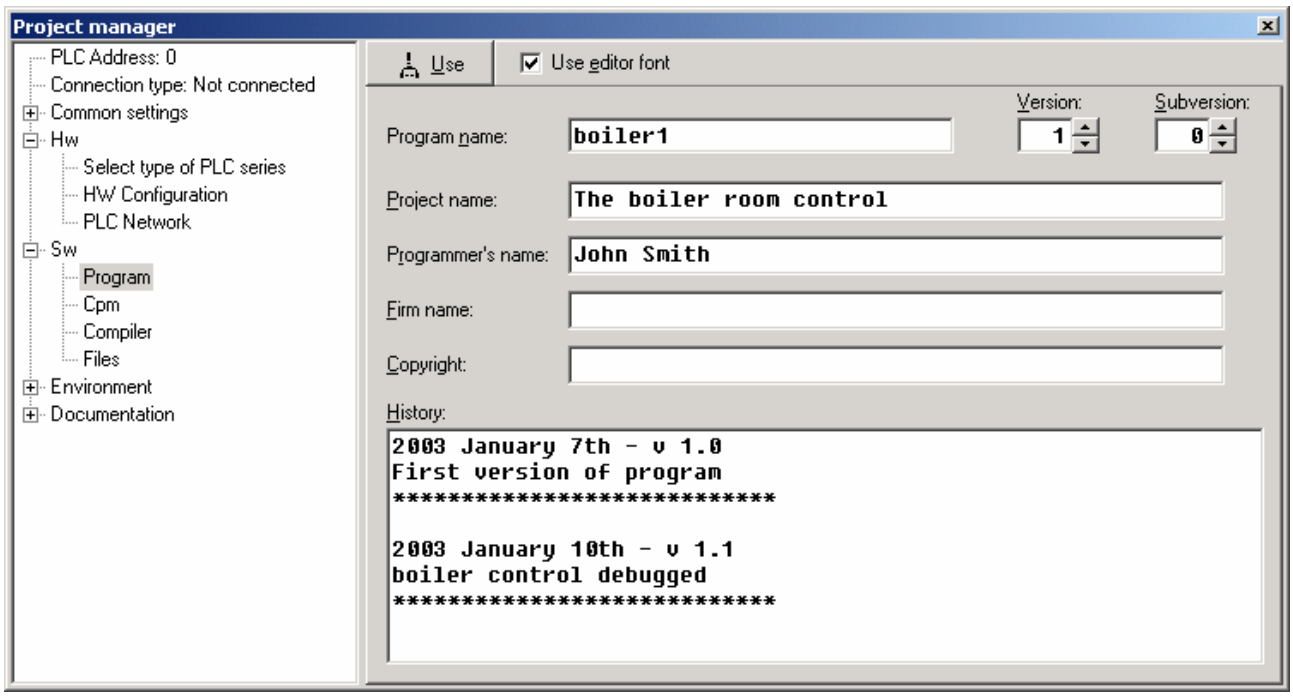
Set HW configuration

The following figure shows a resultant configuration.



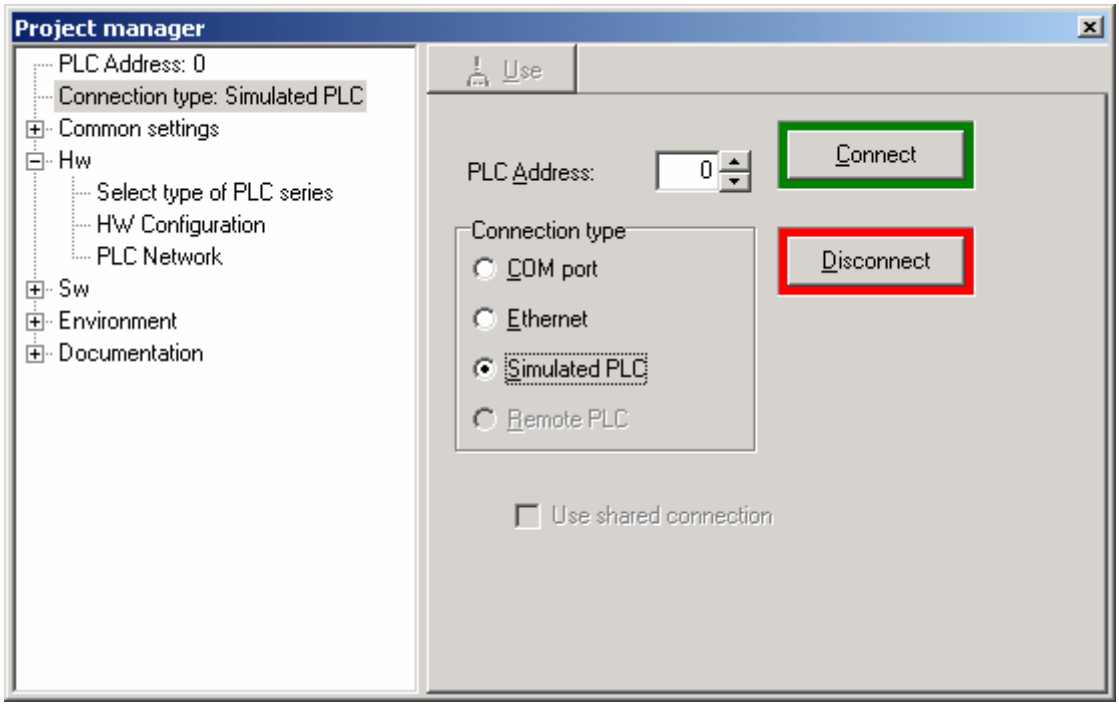
Program information

In the next step, it is advisable to fill in the dialog with program information. This dialog will appear in the project manager by clicking the item *SW | Program*. The information filled in will become part of the project and later on, they can be used for distinguishing program versions including comments made to individual versions.



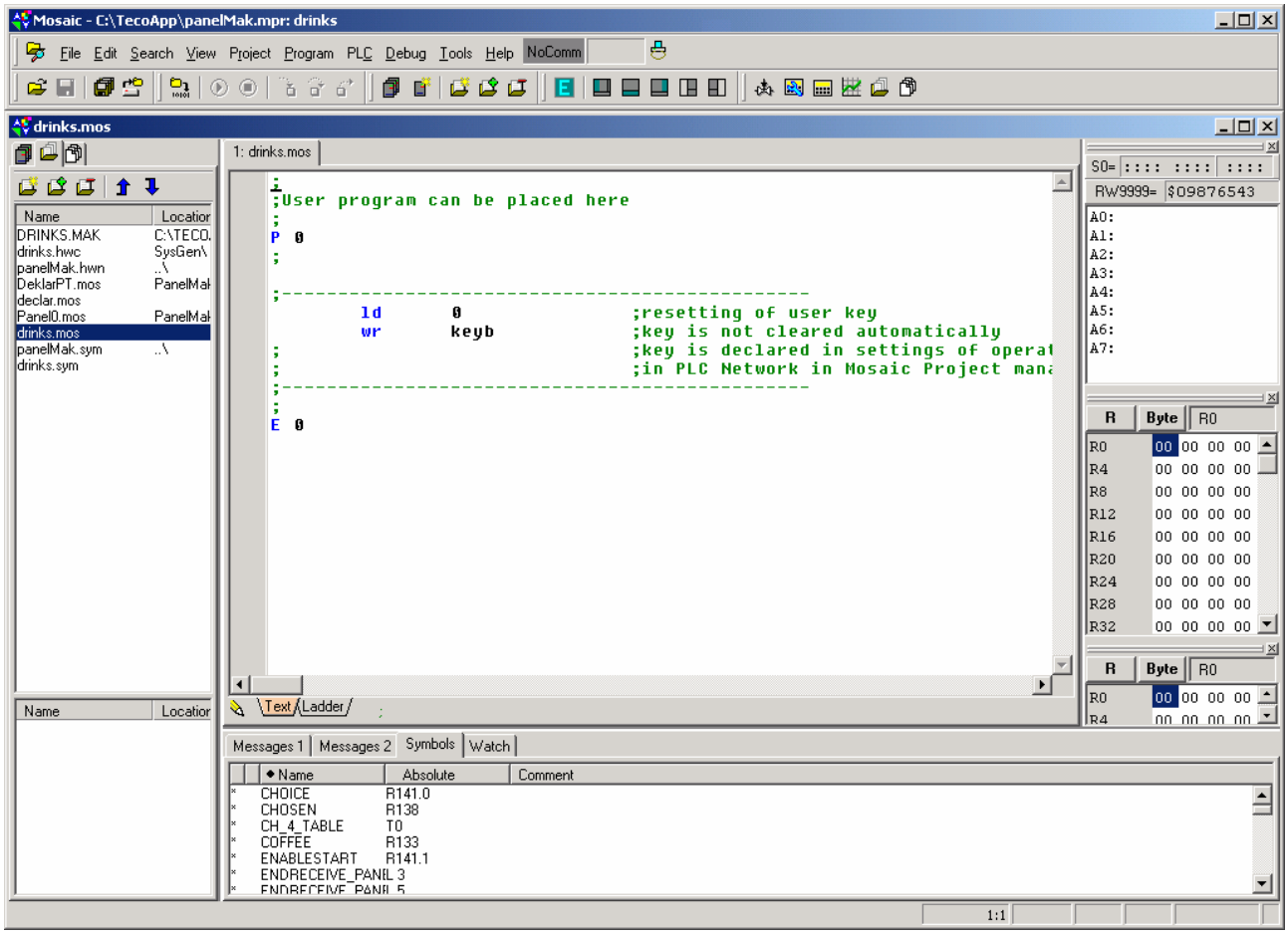
PLC setting - simulated / real

Further, it is necessary to select a type of the PLC connected. The corresponding dialog window can be called any time in the project manager by clicking the item *Connection type*. The option *COM port* assumes a PLC system connected through a serial line, the option *Simulated PLC* uses the PLC simulator for program debugging, this simulator is part of the Mosaic program. Select a simulator and click the button *Connect*.



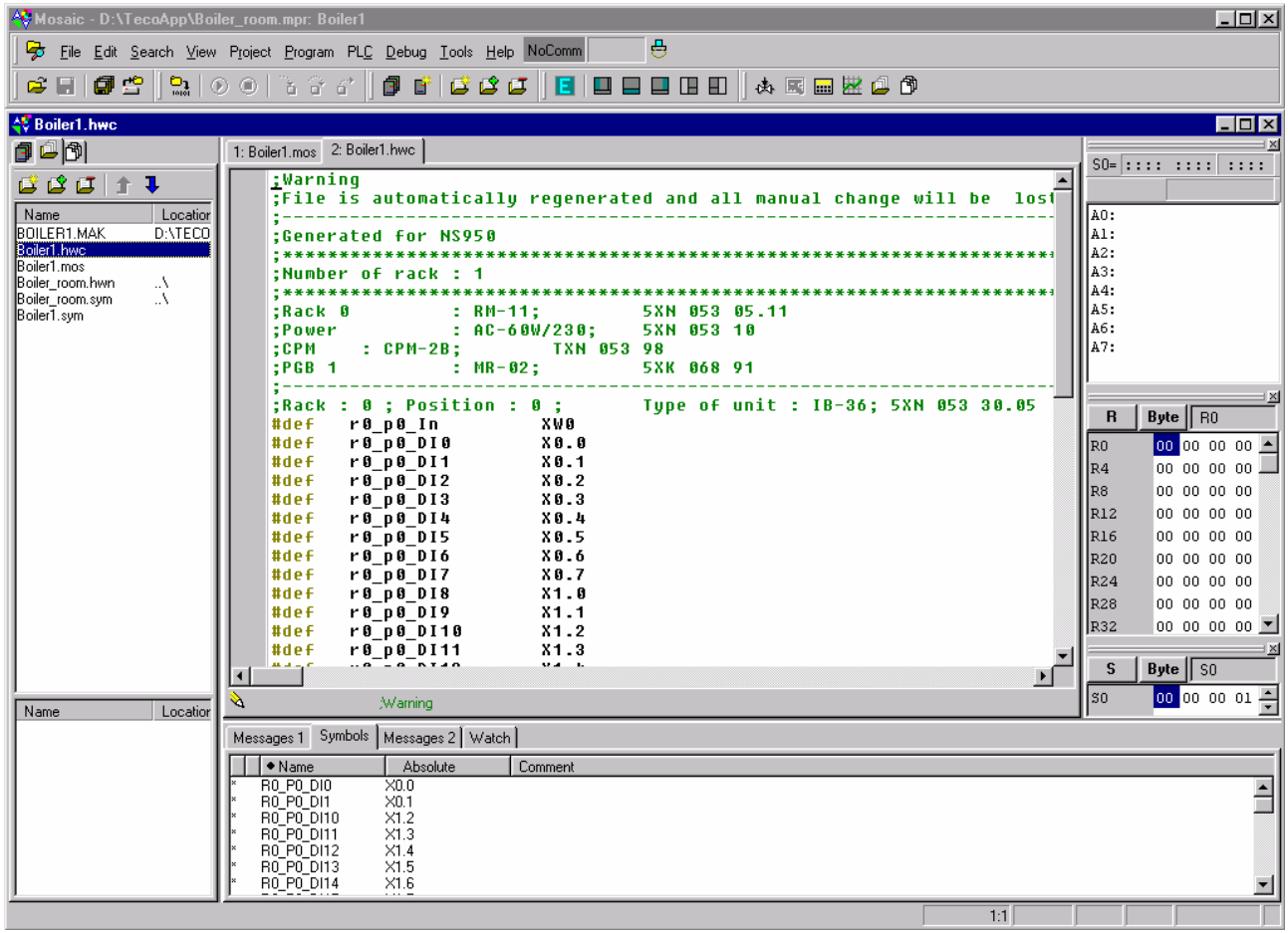
Project file manager

By clicking the icon of file list, you switch from the project manager to the project file manager. This is shown on the following figure. The left window contains a list of all files in the current project.



Open an other editor window

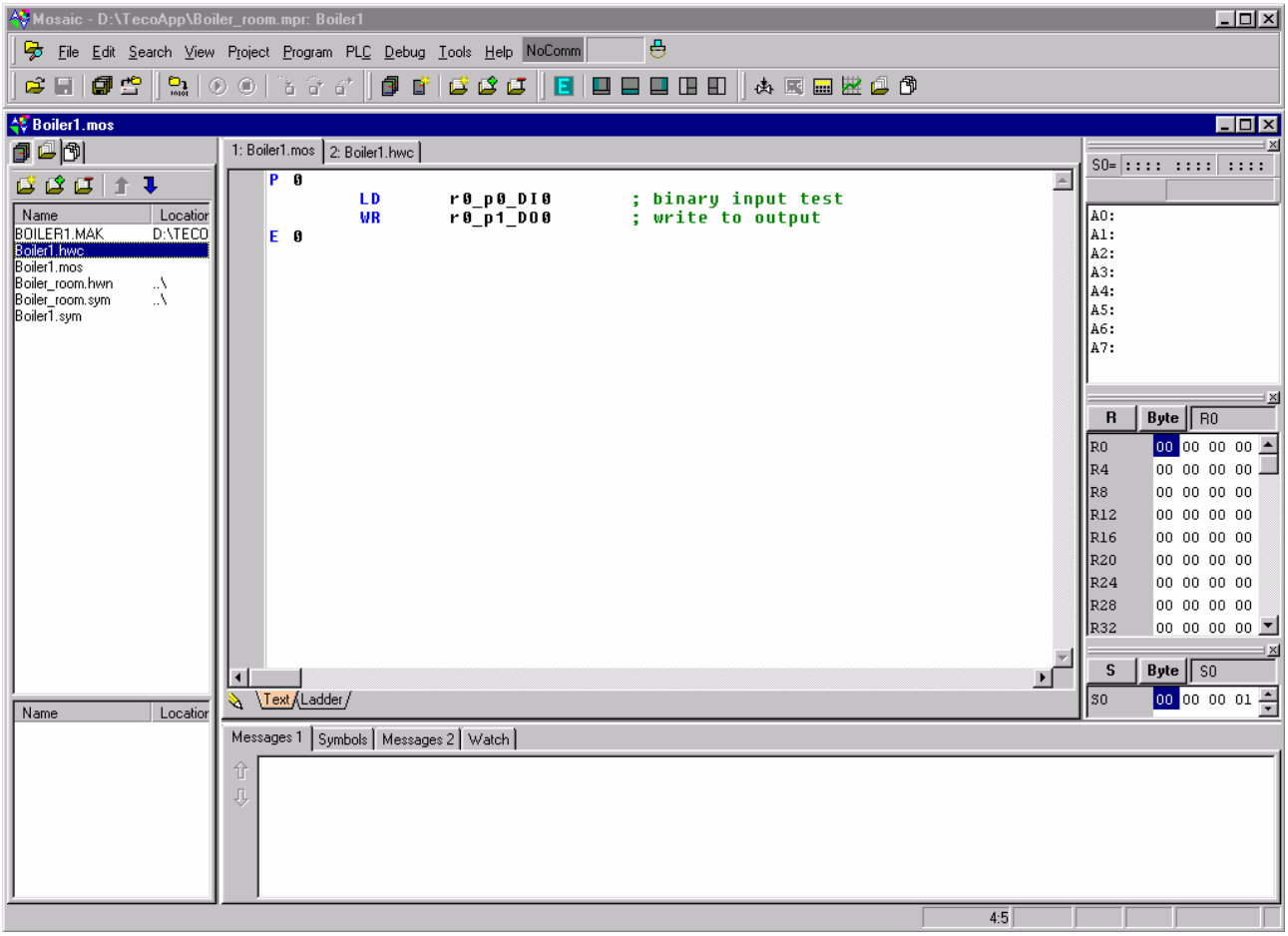
By double-clicking a file name, the highlighted file will be open in the editor. By doing this, you can for example view the result, how the tool for PLC HW configuration works by opening the file Boiler1.hwc. This file contains the declarations for the input and output units specified during PLC HW configuration.



Program write

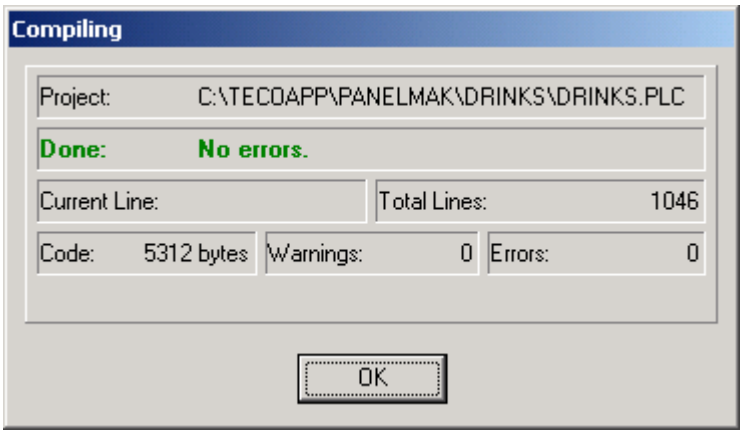
The symbolic names for inputs and outputs of the PLC are created according to the following key. The name r0_p1_DI0 marks binary input 0 (**D**igit **I**n **0**) on the unit fitted on position 1 (**P**osition **1**) in rack number 0 (**R**ack **0**).

The symbolic names for inputs and outputs can be used in the PLC application program. By doing this, an easy program copying the state of the input to the output will look like as follows:



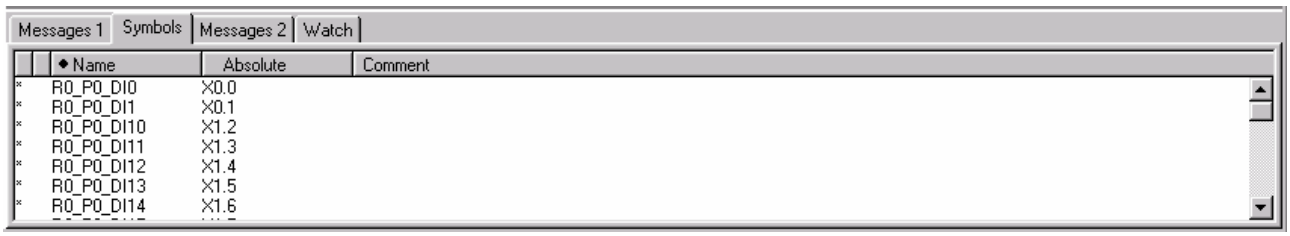
Program compilation

This program can be compiled. By pressing the F9 key (or clicking the compilation icon) the compiler will start. The result of the compilation will be displayed in a separate window.



Symbols window

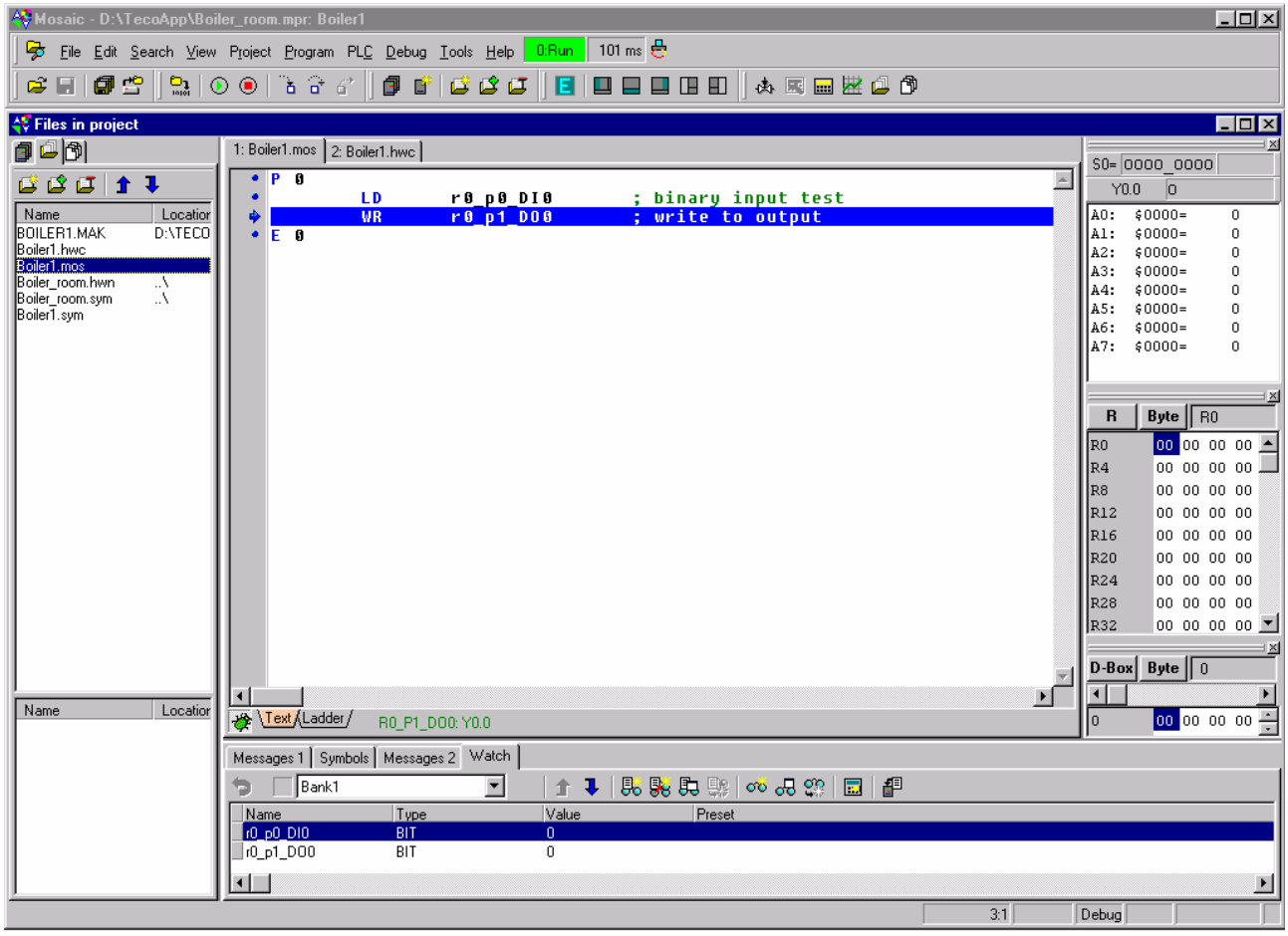
The value assignment for symbolic names used in the program can be found in the window *Symbols* after compilation.



Program debugging

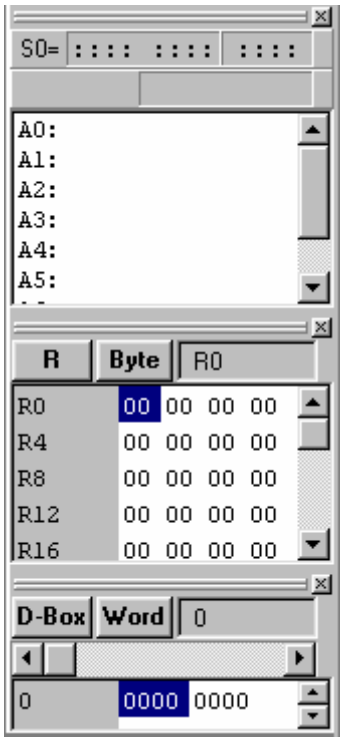
The compiled program will run by clicking the icon *Starting execution of program in the PLC* or by simultaneous pressing of keys CTRL F9. Because the program have not been transferred into PLC, the following message is displayed.

By pressing Yes button the program is transferred in to PLC and runs immediately. A PLC mode change is signalised in the upper bar of the main panel. In the left grey bar of the editor window, breakpoint marks and current instruction marks will appear, to which the window of the accumulator relates.



Accumulator and memory windows

To monitor program run, windows *Accumulator* and *Memory* can be used. These windows can be controlled for example by right click on the window area. A local menu will appear, containing the current options for the relevant window.

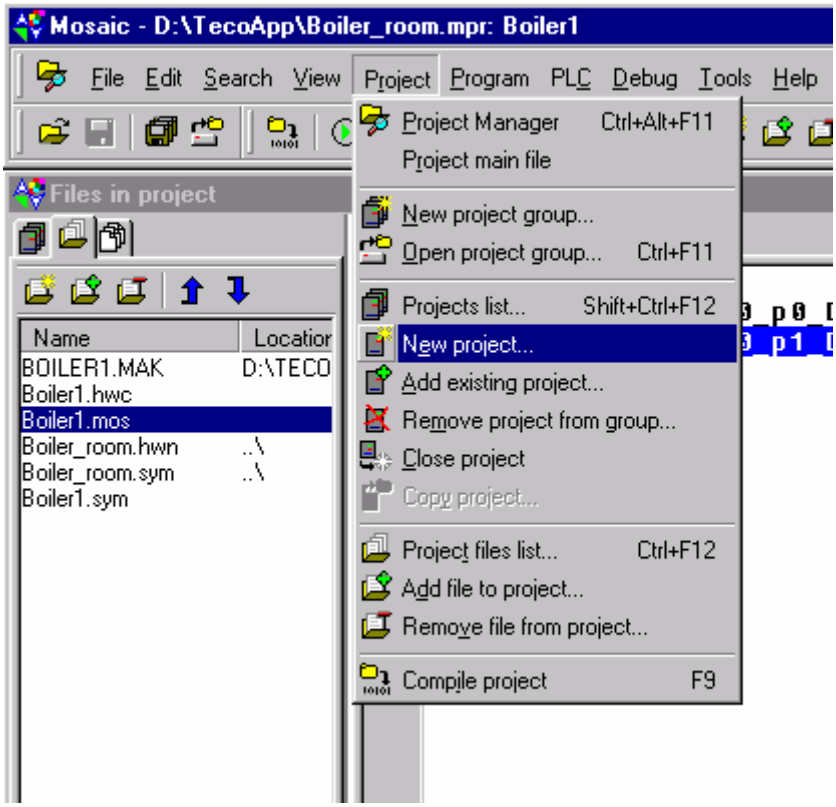


5. ADDING A NEW PROJECT

Each project group in the Mosaic development environment can contain any number of projects for particular control systems. Each project contains information on system configuration and composition of files containing the program for the control system. The setting of the serial channels for communication, etc. is part of this information. The projects within one project group then can share declarations for network interconnection among control systems. This significantly reduces the risk of configuration errors and when programming data exchange among control systems.

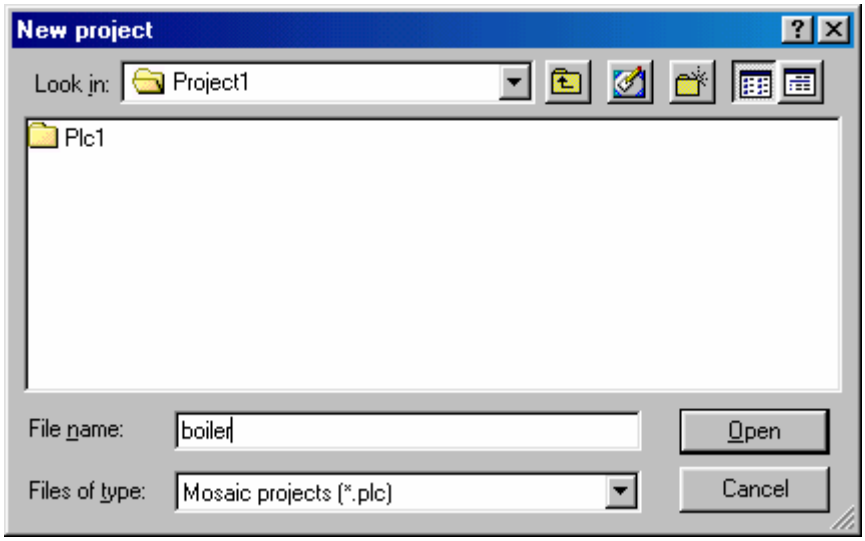
Adding a new project

This section describes the process when adding a new project. The new project can be added for example from menu *Project* | *New Project…* as you can see from the following figure:



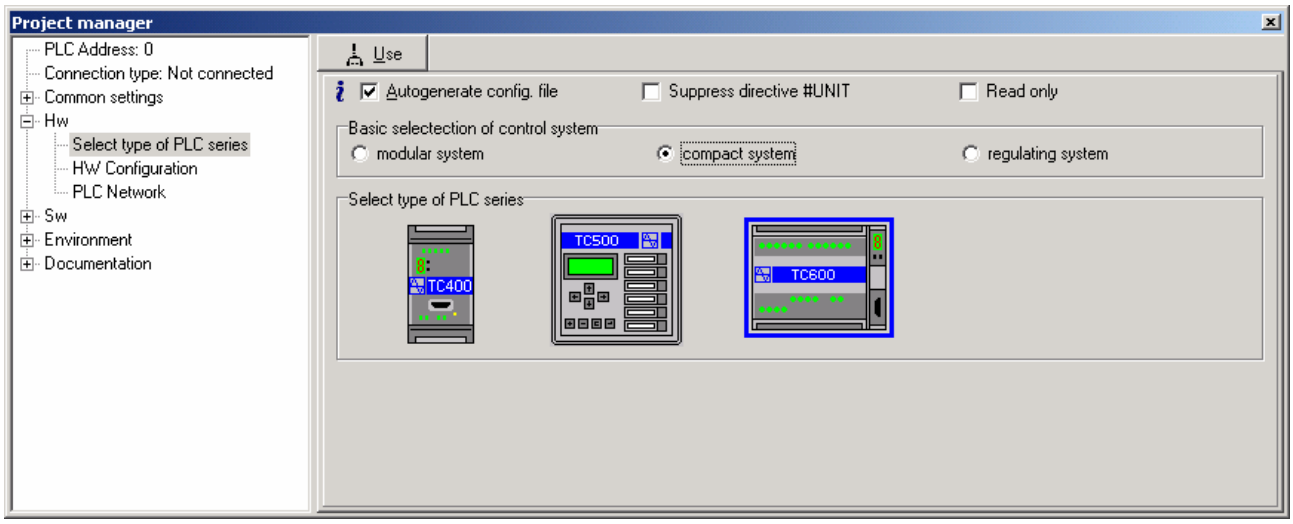
New project name entry

Then a dialog will appear to enter a name of the new project in the group. By default, names Plc1, Plc2, etc. are offered. For a better orientation in these projects is advantageous to enter your own name for the new project, so that the name is not the same as in the other projects. By doing so, you will avoid mistakes and confusions during later modifications.

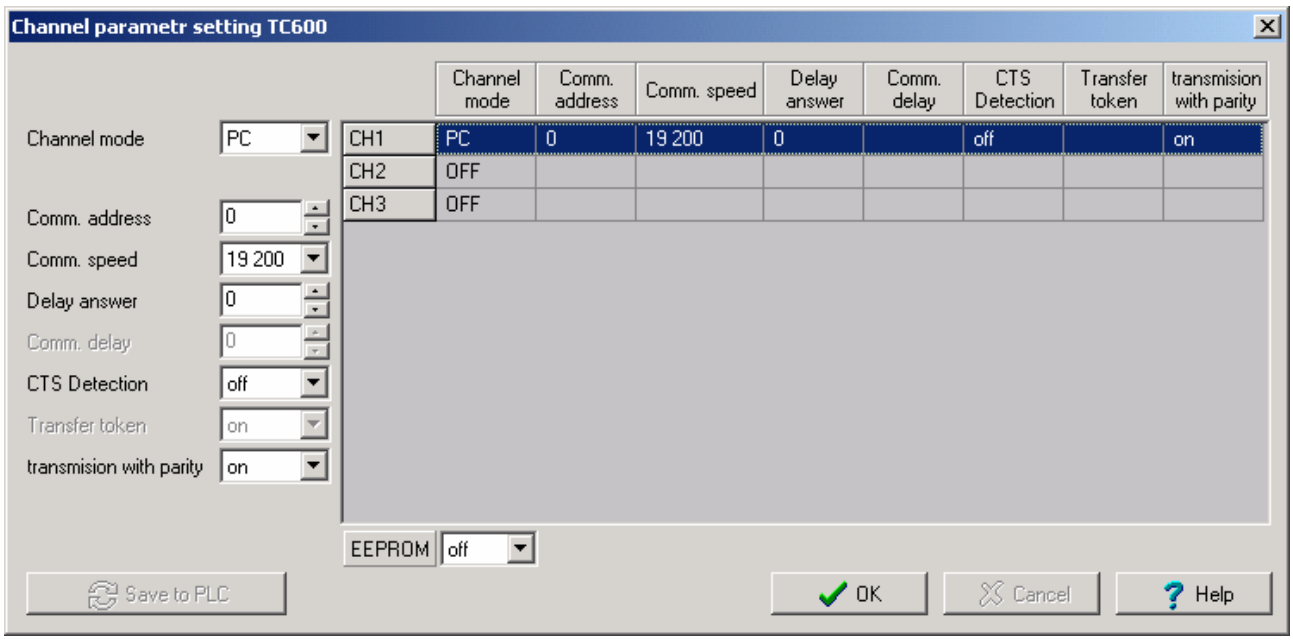


Control system type selection

After you enter the name of the project, a dialog automatically appears to select a PLC series. For change we will select the TC600 system by clicking the corresponding PLC figure.

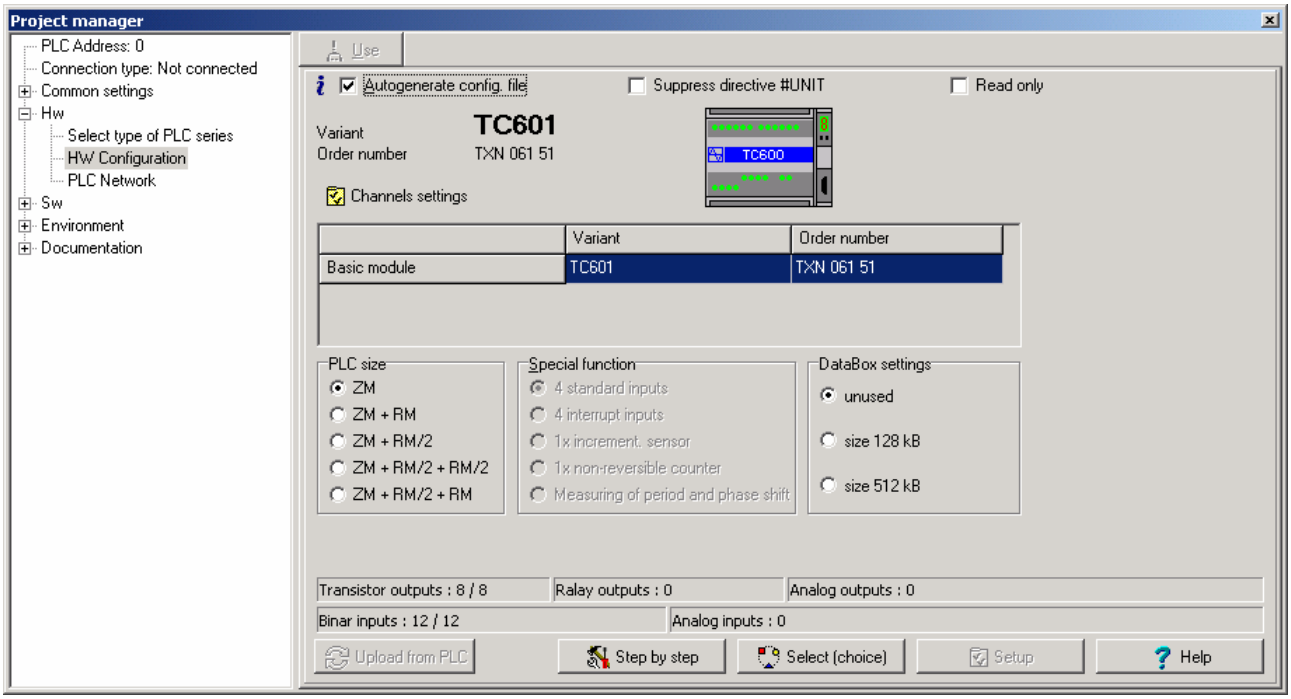


In the next dialog window, we will set the serial channels. This is important for later creation of networks among PLCs or for the connection of operator panels.



HW configuration TC600

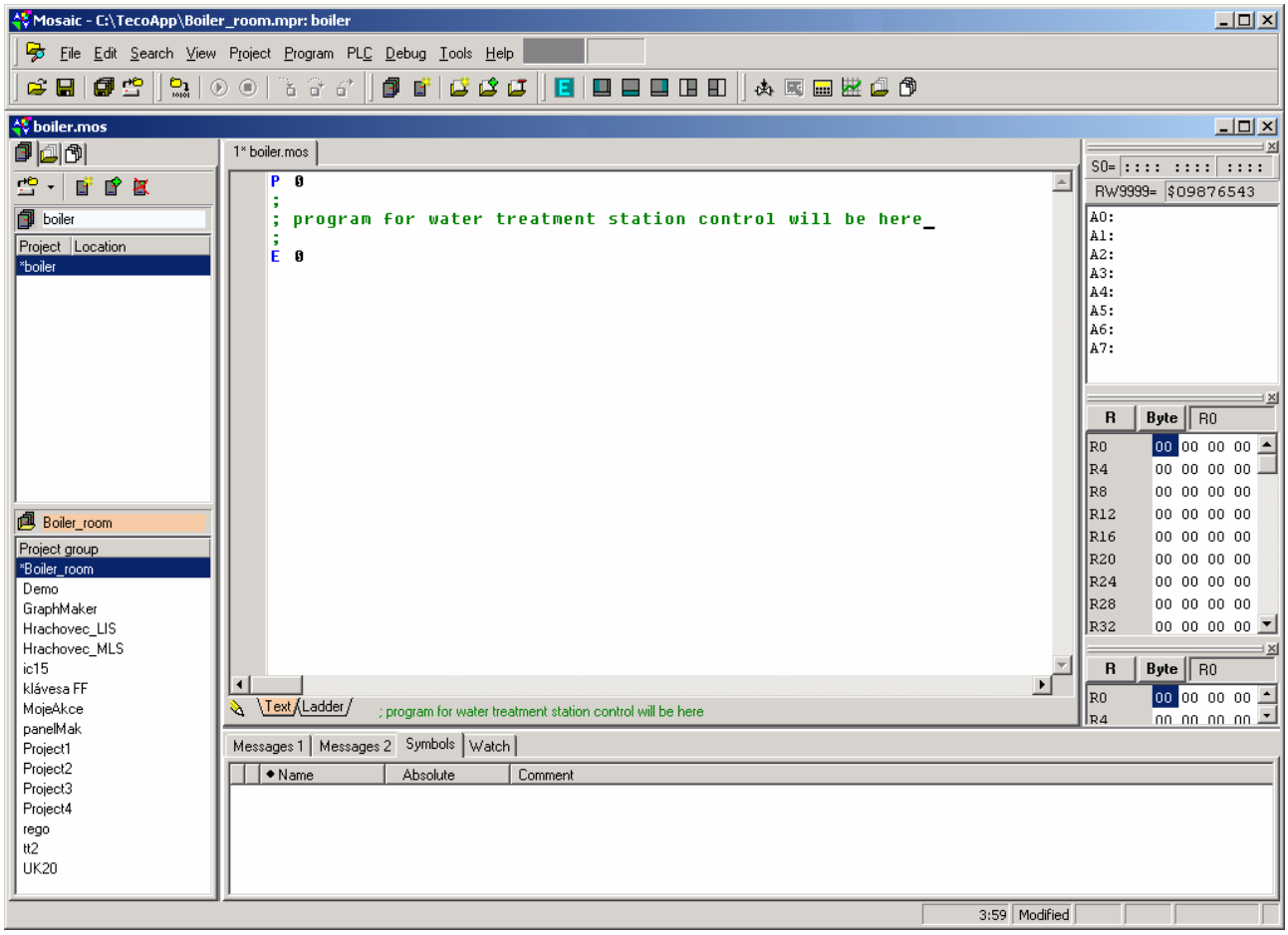
The following dialog window allows setting TC600 HW configuration.



If a real PLC is connected with the computer, it is possible to use the button *Upload from PLC* to set HW configuration. After clicking this button the information from the connected PLC will be read and based on the information, the window for HW configuration will be set. The other features in this window allow changing the configuration manually.

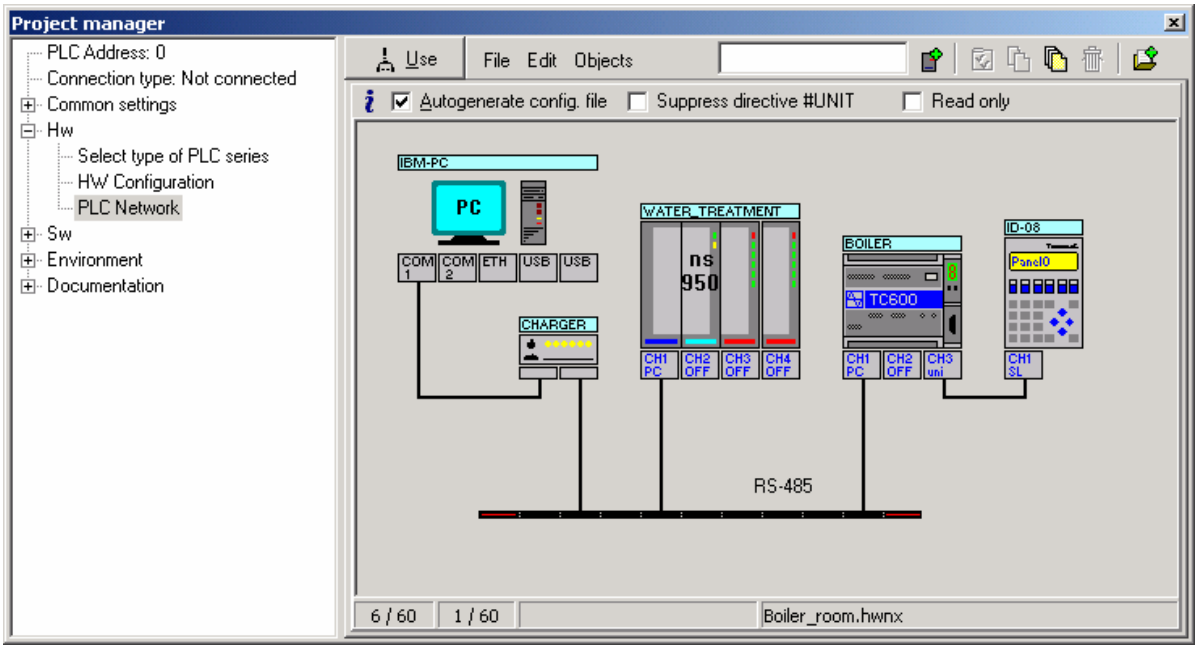
Program editor

By clicking the editor bookmark Water_treament.mos you switch from the project manager to the editor and you can start writing your program, compiling or debugging it, etc.



Network configuration manager

The last figure shows a possible use of the project manager for PLC network configuration. This tool allows graphical describing of the interconnection of the PLCs in the project group, including the interconnection of the PLCs with the computer for programming or visualization and the connection of the operator panels to the PLCs.


Project manager
PLC Address: 0
Connection type: Not connected
Common settings
Hw
Select type of PLC series
HW Configuration
PLC Network
Sw
Environment
Documentation
Use
File Edit Objects
Autogenerate config. file
Suppress directive #UNIT
Read only
IBM-PC
PC
COM 1
COM 2
ETH
USB
USB
CHARGER
WATER_TREATMENT
ns 950
CH1 PC
CH2 OFF
CH3 OFF
CH4 OFF
BOILER
TC600
CH1 PC
CH2 OFF
CH3 uni
ID-08
Panel0
CH1 SL
RS-485
6 / 60
1 / 60
Boiler_room.hwnx

6. MENU AND ICON DESCRIPTION

Mosaic environment main menu

List of graphical icons used

- Project manager (Ctrl+Alt+F11)
- Open file to editor (Ctrl+O)
- Save the current file from editor (Ctrl+S)
- Save all files
- Open group of projects (Ctrl+F11)
- Compile project (F9)
- Starting execution of the program in the PLC - Program run (Ctrl+F9)
- Stop execution of the program in the PLC – Program Halt (Ctrl+F2)
- Single-step execution of the program including subroutines and macros (F7)
- Single-step execution of the program without subroutines and macros (F8)
- Go to the end of the subroutine or macro
- List of projects in the project group (Shift+Ctrl+F12)
- Add a new project
- Add a new file to project
- Add existing file to project
- Remove a file from project
- Enlarge the main panel and back (F5)
- Display / Hide left panel
- Display / Hide bottom panel
- Display / Hide right panel
- Increase / Lower left panel
- Increase / Lower right panel
- PIDMaker Tool
- PanelMaker Tool
- Panel simulator
- GraphMaker Tool
- File list in the project
- List of open files in the editor

Editor window graphical icons used

Edit / Debug (Alt+F6)

Debug / Edit (Alt+F6)

PLC status indication in the Mosaic main menu

Simulated PLC run

Simulated PLC stop

Simulated PLC stop, the program has not been loaded into the simulator yet

Communication off in simulation

Real PLC stop

Real PLC stop

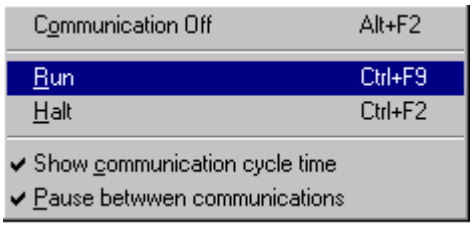
Real PLC run with a different program (the new program has not been loaded yet)

Real PLC stop with a different program (the new program has not been loaded yet)

Error during communication with PLC

Communication off

By right click on the field of PLC status indication, the local menu appears:



Left panel menu

List of projects and groups available

File list in the project

List of open files in the editor

Description of graphical icons used:

- Open project group (Ctrl+F11)
- Add new project
- Add existing project
- Remove project from project group
- New file to the project
- Add existing file to the project
- Remove file from the project
- Change the order of file compilation in the project, move up
- Change the order of file compilation in the project, move down

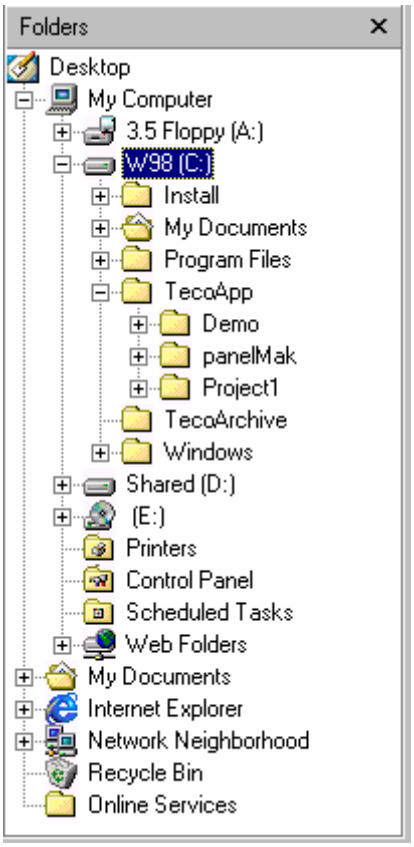
PLC network configuration editor menu

Description of graphical icons used:

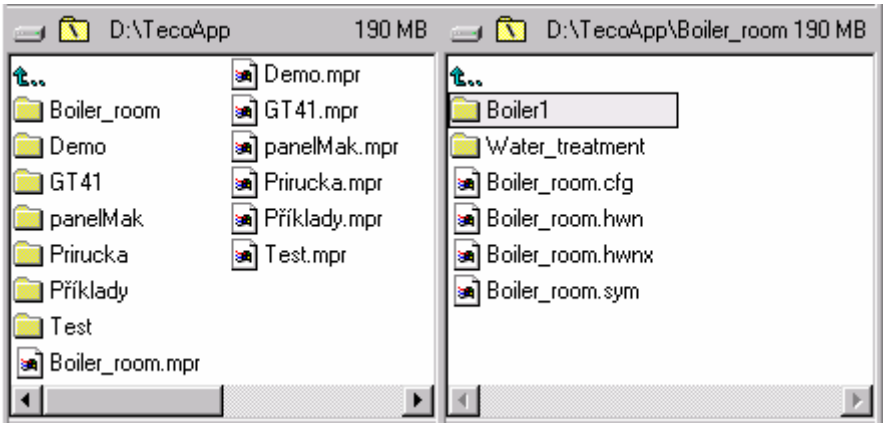
- Add PLC from project to the network
- Setting serial communication channels
- Copy the selected project as a picture to clipboard
- Copy all objects as a picture to clipboard
- Delete the selected project
- Add network configuration file to the project

Overview of file types used by the Mosaic development environment

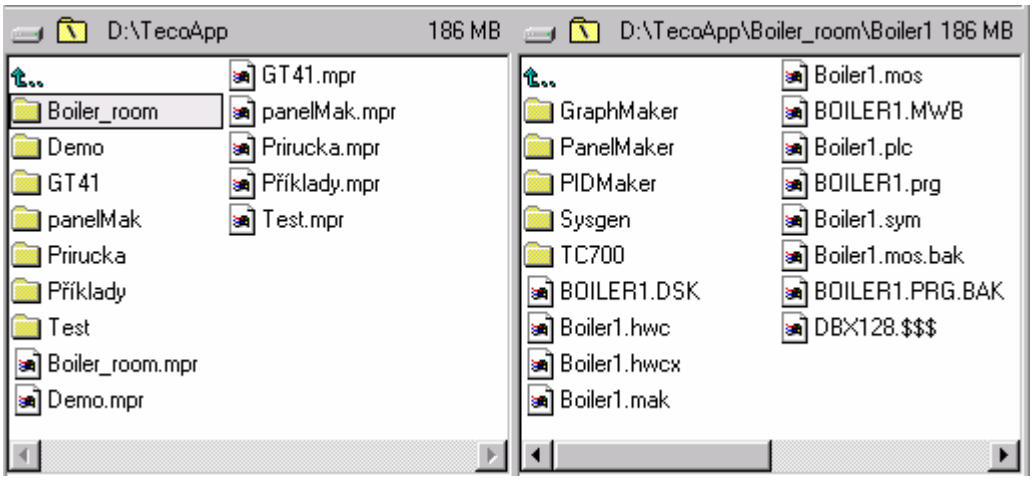
An example of directory folder structure on the computer disk:



An example of control file location for particular projects (left) and control files of network interconnection of PLCs (right).



An example of file location from particular PLCs



Mosaic files extensions used

***.mos** - Source text (**Mo**saic **s**ource)
***.mos.bak** - Source text backup
***.pam** - Panel
***.pam.bak** - Panel backup
***.sym** - **Sym**bols (name declarations)
***.sym.bak** - Symbol backup
***.mlb** - Libraries (**M**osaic **lib**rary)
***.mlb.bak** - Library backup
***.mak** - Control file (**mak**e)
***.mpr** - PLC group project
*.**hwc** - **HW c**onfiguration
***.hwcx** - Hardware configuration auxiliary file
***.hwn** - PLC network (**HW n**etwork)
***.hwnx** - PLC network auxiliary file
*.**hlp** - Help (**hel**p)
***.dsk** - Auxiliary file (**d**e**sk**top)
***.cfg** - Auxiliary file (environment **c**on**fig**uration)
***.prg** - Auxiliary file (debugging information on the **p**ro**g**ram)
***.plc** - Project of one **PLC**
***.res** - Auxiliary file (**res**ource)
***.rus** - File for hardlock upgrade
***.sys** - System declarations
***.95a, *.95b, *.95c, *.95d, *.95e, *.95m, *.95s** - PLC user program binary code
***.tab, *.tac** - Binary code of PLC user tables for the model with separate space
***.dll** - Plugin modules, USI code for the simulator
***.uia, *.uib, *.uic, *.uid, *.uim, *.uis** - PLC USI code
***.$$$** - Auxiliary file for DataBox simulation