merbon
VISUAL

Installation and setup
(mobile devices + HT200)

Powered by

domat
control system

Contents

Application description

The application displays and enables to edit values from free-programmable controllers (PLC) Domat MiniPLC and mark... The tree menu structure has to be engineered in the HMI Editor, and the exported menu will be open in the application where also the parameters for connection to the controller(s) have to be set. The application is available for the following operation systems:

- Android,
- iOS.

To communicate to the controllers, the SoftPLC Link protocol for MiniPLC and SSCP (Shark Slave Communication Protocol) for mark and wall are used, which are proprietary communication protocols designed so as to communicate safely over the internet. The application uses LCD menu definition files, which are products of HMI Editor (the editor version must correspond with the firmware version in the PLCs). The application supports Merbon IDE version ER2 and later, and SoftPLC version 2015-12 and later.

Installation

Android

The application is available at Google Play. The definition file must be uploaded to the mobile device using Bluetooth, USB cable, e-mail, over a cloud storage, etc.

iOS

The installation is available at App Store. The menu definition files must be uploaded to the mobile device over iTunes. The files can be opened directly from the system – select „Share" and „Copy to Merbon Visual".

Definition opening on mobile devices

The definition can be opened directly from the system. Before opening the definition is necessary have running the Merbon Visual in the background. The following procedure is basically the same for operating systems Android and iOS.

1. In one of the file browsers we will find the downloaded definition in .zip format.
2. After long press the definition file would be bring up the menu. Select "Send" or "Share".
3. In the "Send items to" or "Copy to" dialog box, select the Merbon Visual application. This will open the application and load the definition file.
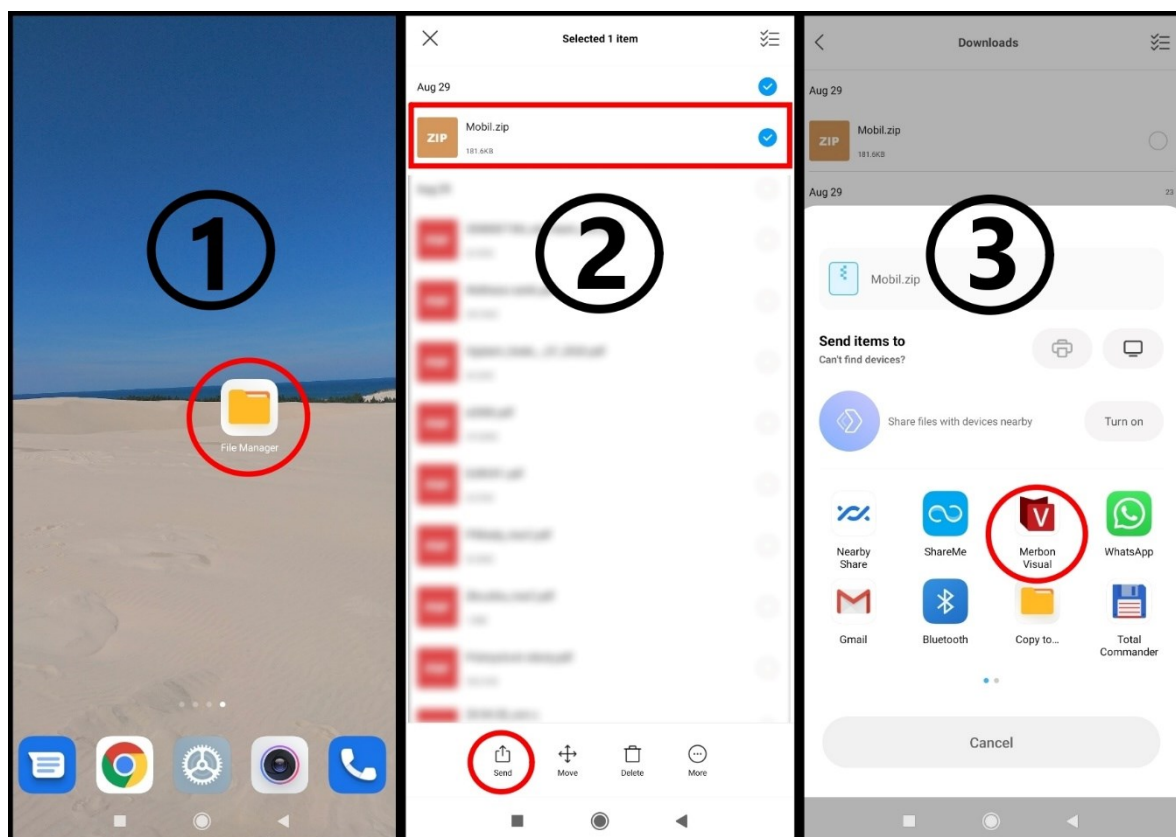
Figure 1: Steps for opening the definition on mobile devices

HT200

For graphics terminal HT200, Merbon Visual is included in installed firmware. The definition can be uploaded via the web interface or using a development environment Merbon IDE (using a „Upload to terminal" function).
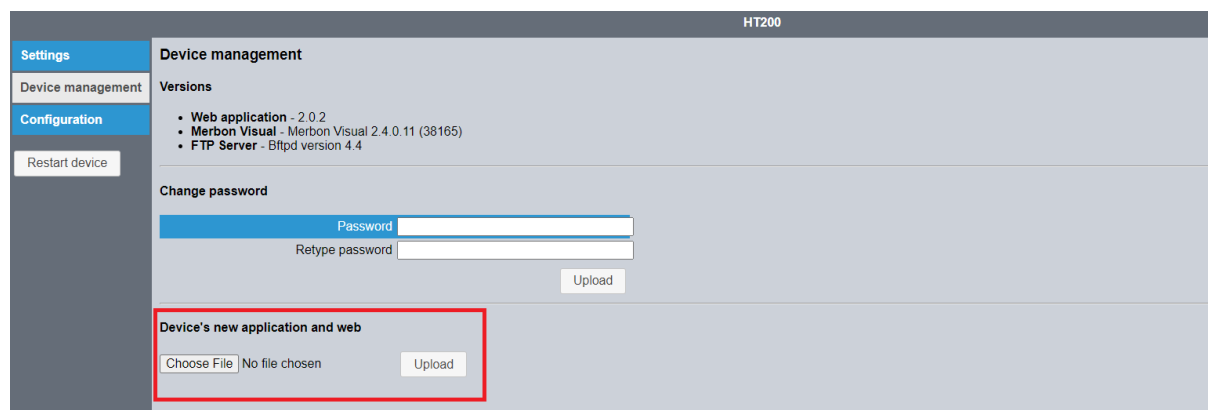

Figure 2: Web interface of graphics terminal HT200

Used icon

🔔	No alarm – normal state
🔔	Acknowledged alarm – alarm acknowledged by user, pending
🔔	Acknowledged unreset alarm – alarm acknowledged by user, alarm is off, waiting for reset
🔔	Active alarm – unacknowledged pending alarm
🔔	Unacked, unreset – unacknowledged alarm, alarm is off, waiting for reset
I	Text item – informative text, name of group of data points or branch of the menu tree
🔒	Menu branch protected by PIN – PIN must be entered as a 4-digit number
📅	Current date and time of the controller, as provided by real time clock
📅	Current date and time of the controller – settings
Ⓐ	Analogue value (indicator) – temperature, humidity, pressure etc
D	Digital value (indicator) – device or aggregate status (on / off) etc
Ⓐ	Analogue value (setting) – changing of temperature, humidity, pressure etc. setpoint
D⁺	Digital value (setting) – changing operation mode, setting a device or plant on or off, etc.
⏲	Time scheduler (binary – on / off) – weekly time scheduler for control of plant according to a predefined switching table
⏲	Time scheduler (integer) – weekly time scheduler for control of plant according to a predefined switching table, selection of multiple values like Comfort, Standby, Off etc.
⏲	Time scheduler (analogue) – weekly time scheduler for control of plant according to a predefined switching table, each event is assigned an analogue value
≡	Menu
🗐	Menu for browsing between pages
🔔	Alarm log
📁	Open – Dialog for reading of the menu definition
→	Login
ⓘ	About
⚙	Settings
👤	User profile
⊠	Exit
📤	Open – enter path to menu definition file
📁	Returns recently used menu definition
🗑	Deletes the menu definition path

Main screen

After installing and launching the application, the main screen is displayed:
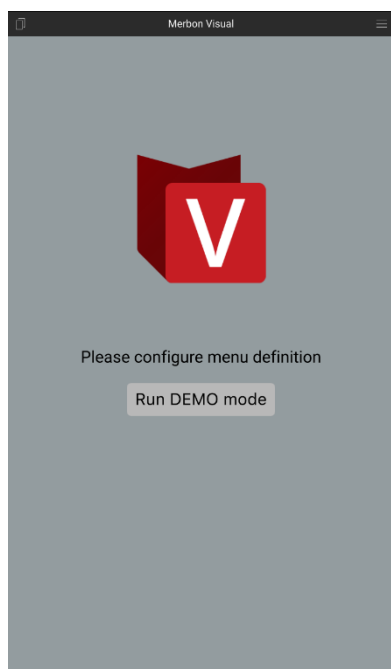
Figure 3: Application without definition file

Figure 4: Example of text definiton
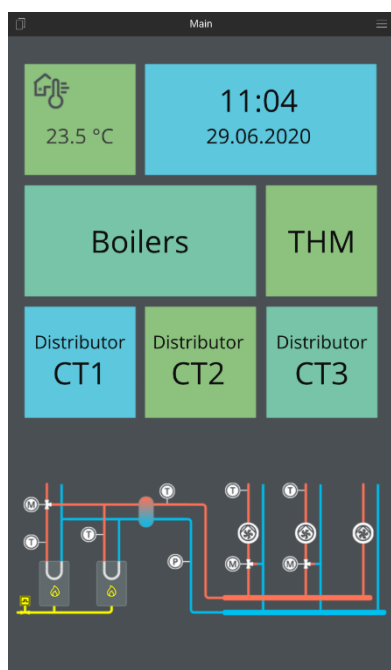
Figure 5: Example of graphic definiot
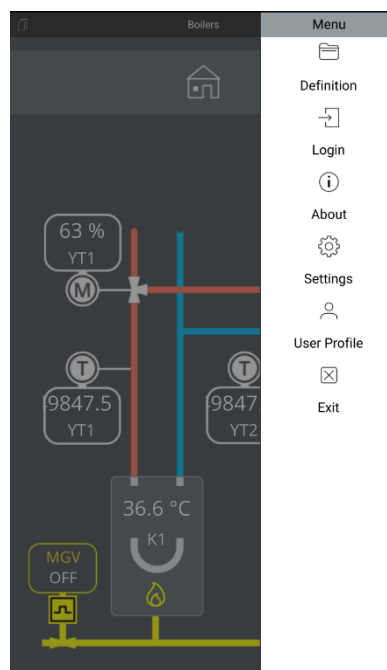
Figure 6: Application menu bar

The screen have a 3 parts:
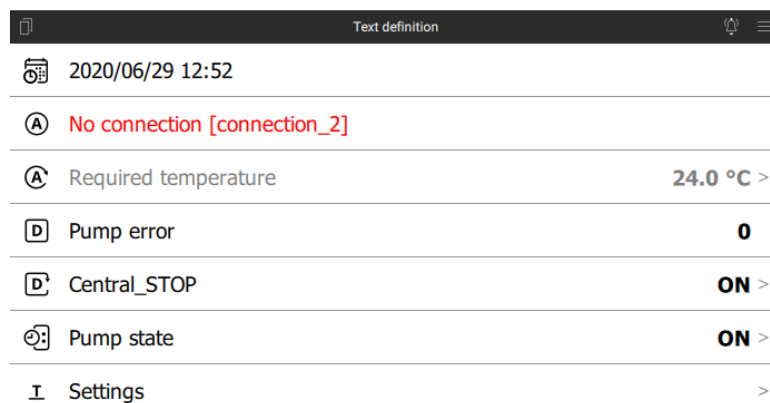
- application name,
- application menu,
- workspace.

Application name is located on top area of application. On the sides is located buttons for controlling a application. All this components are included to a header.

Under header is located a workspace. Content of workspace is determined by programmer. Typical located here topologic schematic, measured values, date etc.

Text definition

The items are listed according to their position in the menu tree. The item which contains a dialogue or submenu is displayed with arrows in the right part of the line. It means that by selecting the item the submenu branch is activated.

Figure 7: Text definition example

Each item has a text with colour depending on the variable status:

Table 1: Colours explaining

red	Communication error. Included error text
light red	Last known value
green	Manually set value (only in SoftPLC RT)
blue	Bad quality. The value is read from the controller, but it is tagged by the controller as of bad quality – there may be a problem with I/O modules: check if the controller is OK (only in SoftPLC RT)
black	Read value, normal state
grey	Unknown value. Still being read: wait until the readout is complete

The navigation in the tree follows over clicking the menu item which supports this function. It is not possible to change the value if it has not been read and is being read, or if it is in communication error or of bad quality.

To make navigation easier, there is the complete menu path listed below the header. By clicking this path the user navigates one level higher. This information is not displayed on the main page and in the value edit mode.

Editing a value

The editing mode is displayed if the corresponding variable is editable, i.e. if its value can be changed by the user. Editable values are:

- date and time (real time clock in the process station to control the time schedules),
- analog value (temperature, humidity, or pressure setpoint etc.),
- digital value (switching a device on or off, operation mode change etc.),

- time scheduler (weekly scheduler for time-based automatic switching of operation modes or device states).
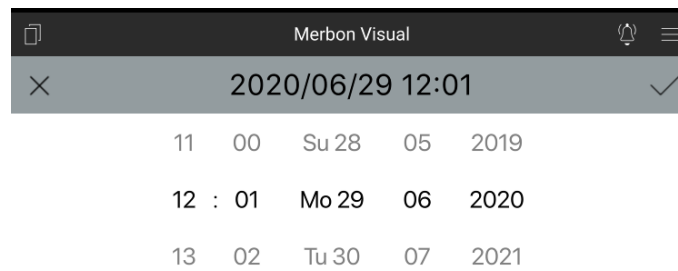
Figure 8: Date and time editing

In the setting header there is a icon for confirming of changes (tick symbol on the right), and cancelling of changes (arrow at the left). The symbols are grey until the value is edited. Then they change colours to indicate that the value has been edited. The green tick accepts changes, the red arrow cancels changes.
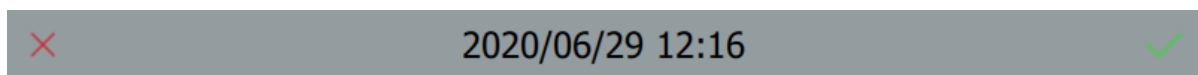
Figure 9: Example of changing a value

A special item is an Alarm. If an alarm requires user intervention, like acknowledging or reset, the item is displayed similar to an editable item with alarm status icon as in the table above. Alarm can be acknowledged or reset similarly to editing a multistate value.

Active alarm can be acknowledged, inactive alarm can be acknowledged and reset. The operation depends on how the alarm has been engineered. Mostly, after the alarm is off and reset, the technology resumes normal operation.

Date and time
Editing of time is only possible if the time display item has the "editing allowed" arrow at the right-hand side. Date and time are usually just for information, they can be changed only in the PIN-protected menu branches. When editing, the default values are current date and time of the PLC. The date / time format is DD/MM/YY HH:MM. If a date is changed, the number of days in month is recalculated together with the leap year calculation.

Analogue value
Analogue value is set using a slider or the + or - buttons. The step is defined in the menu definition file for each value separately. The step also specifies the number of decimal places for display.

Default value is the actual read value from the PLC. If the value is out of the preset steps, then it is synchronized with the configuration only after reaching a lower or upper limit value.
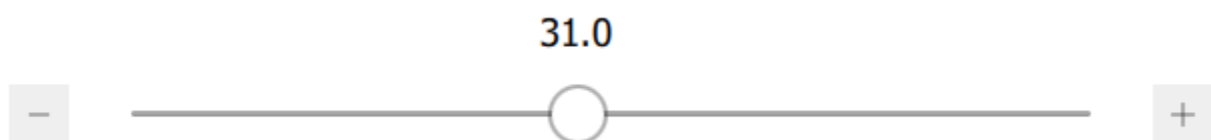
Figure 10: Analogue value setting

Digital value

A digital value may be not only a switch (on / off), but also an integer value (selecting from more states). The list of values and their names is defined in the configuration file. After clicking the digital value setter, the list of states is displayed to select from. The control element displays the current state.

D: Central_STOP   **ON** >

Figure 11: Digital value setting

Default state is the actual (read) state. If the state name is not specified in the configuration file, a „UNKNOWN" text is displayed, and this variable can not be set to any other state.

Time scheduler

A time scheduler is a complex object containing more information: actual value, list of transitions within a week, and list of exceptions (intervals of days when the preset value is overridden by another value - used at holidays, factory closures etc.).

If a Time scheduler type is in the menu definition, it displays its current value first, and after it is clicked, it reads and displays the list of transitions and exceptions.

⊙: Pump state   **OFF** >

Figure 12: Current set value

Text definition			Text definition	
× Pump state OFF ✓			× Pump state OFF ✓	
Mo 00:00	ON 🗑		From: 26.06.2020 08:00 To:28.06.2020 20:00	OFF 🗑
Mo 05:00	OFF 🗑		From: 29.06.2020 12:00 To:30.06.2020 12:00	ON 🗑
Tu 00:00	ON 🗑			
Tu 05:00	OFF 🗑			
We 00:00	ON 🗑			
We 05:00	OFF 🗑			
Th 00:00	ON 🗑			
Th 05:00	OFF 🗑			
Fr 00:00	ON 🗑			
Fr 05:00	OFF 🗑			

| + | Exceptions | | + | Plan |

Figure 13: Preview of weekly scheduler   **Figure 14: Preview of exceptions**

The time scheduler transitions list and exceptions list shall be considered as a single set of data. It means that a change in one list is considered as change in the whole list, and both lists are written to the PLC in a single command. Both the weekly scheduler and the exception programs are thus read and written in one command. The weekly scheduler and exception list are switched in the editor by clicking on the Exceptions button. The time scheduler event can be deleted by clicking the Wastebasket icon or by sweeping the row to the left, or changed by clicking the Edit icon. At the Embedded Linux devices just click the line. The changes in the whole list are displayed in the same way as changes of analogue values

🗑	Deleting of an event

A new item is added by clicking the „+" button. The item is added to the current list (weekly scheduler or exceptions). Added or edited values are marked by a red stripe at the icon. Maximum number of items depends on the PLC, and is at least 40 events a week and 10 exceptions.

Figure 15: Change value

Time schedulers are of three types:

- binary – true/false (on/off),
- integer – one of several states (selection from more states),
- analogue – analogue value in limits given by definition in the HMI menu editor.

The difference between them is the displayed and editable value type only. While binary and integer schedulers are set as digital value, the analogue scheduler is edited as an analogue value. There is always the time of transition at the event.

The time and date are set according to the type of the event:

- Weekly schedule item – time and date of the event. It is possible to copy the event to more days,

- Exception item – starting and ending time and day of the exception. It is also possible to move the event to another days.
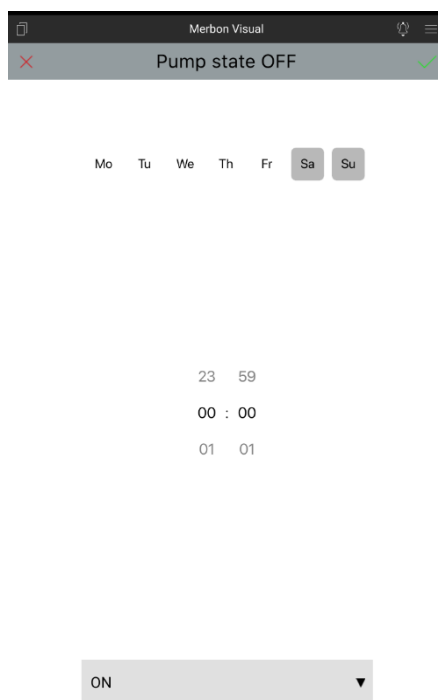
Figure 16: Setting of weekly scheduler

Figure 17: Setting of exceptions

Every single change must be confirmed by the green tick in the upper right corner. Finally, all changes must be confirmed together to be sent to the PLC.

Before the complete schedule is sent to the PLC, it is optimized and redundant events are deleted. Default value is the actual read value from the PLC. If the value is out of the preset steps, then it is synchronized with the configuration only after reaching a lower or upper limit value.

Section protected by PIN

After clicking a menu branch protected by PIN, a PIN must be entered in a dialogue. It is a 4-digit number defined by the application engineer. Users can not change the PINs. If the PIN is mistyped, the application requires a new value. If the PIN is entered correctly, the branch is unlocked and all values are accessible.

In the PIN-protected sections there are usually values like parameters, setpoints, RTC setting, and other values which not every user is expected to change.

A timeout (in minutes) keeps the menu branch open for the user without having to enter the PIN again. After expiration of the timeout, the PIN dialogue displays again. **The user is not logged off automatically.**

Figure 18: Dialog to enter the PIN

Graphic definition

In IDE version 2.3.0.3 and above there is Graphic HMI definition where users may define up to 20 panels with customized user menu. The graphic template contains 14 object types described below. The graphic menu must be assigned to the terminal in the same way as the text definition. Switching between pages follows over the icon at the left upper corner, or by dragging the page from left to right. Then a menu is displayed where in the upper part there is user name of the logged-in user, followed by the list of available panels. The active page is in grey (Figure 19). The menu displays after click in the right upper corner or by dragging the page from right to left (Figure 20).
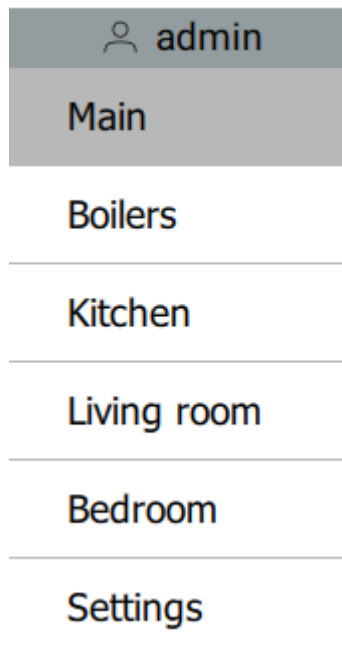
Figure 19: Panels menu   **Figure 20: Application menu**
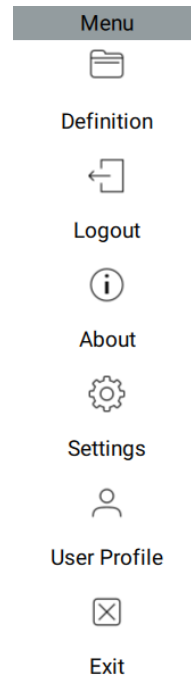
If there is no communication with the PLC, a red dot displays above the value (Figure 21).
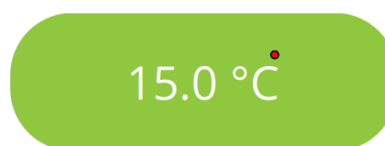
Figure 21: Comunication error

If the changed value is being written into the PLC, an amber dot is displayed (Figure 22).
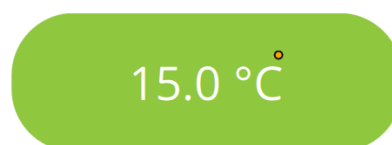
Figure 22: Currently changed value

Alarm

Indicator of alarm states. The object displays status of an alarm block using text or image. An alarm block has five possible states.

Figure 23: Alarm

Analogue value

Display a analogue value. The object allows editing a explored value included changing a unit.
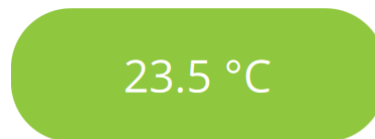
Figure 24: Analogue value

Analogue setting

Object to set analogue value. Item has a same properties as Analogue value. In addition, it is possible to change the icons for the increase and decrease value.
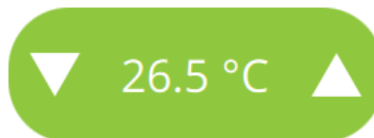
Figure 25: Analogue setter

Button

This object is a simple button to open another page (panel) to display. Buttons picture can be changed.

Figure 26: Button

Date and time

This object displays either the PLC time, or any time value of a DT-type variable.
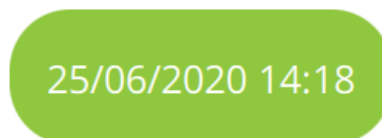
Figure 27: Date and time indicator

Date and time setter

This object displays either the PLC time, or any time value of a DT-type variable. The date and time can also be set here.
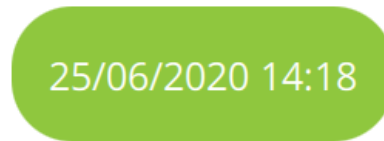
Figure 28: Date and time setter

Digital indicator

Displays a predefined text according to a discrete numerical value.

Figure 29: Digital indicator

Digital setter

Sets a predefined discrete numerical value according to a selected state text from the collection.

Figure 30: Digital setter

Digital setter - ComboBox

Sets a predefined discrete numerical value according to a selected state text from the collection.
Clicking the object opens a menu where the required state can be selected.

Figure 31: ComboBox icon

Figure 32: Unfolded ComboBox icon

Image

This object displays an image taken from an image file.

Figure 33: Image example

Figure 34: Image example

Text

Displays a fixed text. It is used mostly in the main screen (site name), naming of menu branches (Setpoints, Heating, AHUs, Lights, etc.), or to create a submenu with supplier/service contact data (such as web pages and phone number).
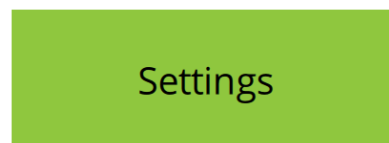
FIgure 35: Text field

Time scheduler

See Time scheduler description in the Text menu.

Figure 36: Time scheduler

Menu

The Menu contains setting of the application and other functions. It is mostly used by the programmer or user who is setting up the configuration. Menu provides the following functions:

Definition

This item allows to toggle, save and download definitions. In the definition setting, it is possible to name and save a currently open project. It is possible to switch between the saved definitions in menu items „Definitions". Also i tis possible to download the definitions from the direclly from the PLC. Here i tis necessary to enter the connection parameters (IP adress, port, user name and password, SSCP address or proxy ID). This function is supported on PLCs with Linux OS. This funtion download a web definition from the PLC.

Figure 38: Saving the definition

Figure 37: Downloading the definition from PLC

Login

User login dialog. The user logs in using his user name and password.

Settings (mobile devices)

The mobile application settings allows edit connection parameters, application language and screen resolution. In connection parameters it is possible to set a connection to another PLC than defined in the menu definition file. In the table there is a list of one or more PLCs which are defined in the menu. Select **Definition file** and a connection to display its properties. If there has to be a different set of connection parameters set, such as if accessing the PLC from the internet rather than from a local network, select **User profile** and click the connection. The customized parameters can be edited then.

Name – Connection name, must be same as in **Definiton file**.

IP – URL or IP address of the PLC, e.g. 192.168.1.45 or plc1.mydomain.com

Port – TCP port where the PLC listens – for SoftPLC Link the default value is 12345, for SSCP the default value 12346. If the PLC had been reconfigured or is accessed from the internet over a router, the port number may be different.

User – name of user who is accessing the PLC. At SSCP several users with different rights are defined, consult with the PLC application engineer.

Password – password for the user entered above.

SSCP adresss – for SSCP protocol only; each PLC has a SSCP address in the range of 0 to 255. Consult with the PLC application engineer. For the SoftPLC process stations, this field nas no meaning.

Proxy ID – for SSCP protocol only; in case the PLC is connected over a proxy server (it is not available from the internet but it can establish outgoing connections to a proxy server), the proxy server identification is entered here. Not used in this version.

All changes are applied after they have been confirmed by the user (the „OK" button).

Figure 39: Connection settings

Settings (HT200)

The settings of the graphic terminal compared to the mobile application do not contain the item "User profile". It also not possible to switch between individual definition files here.
As in a mobile device, you will find the option of editing a connection, choosing the language or customizing the display on the screen. There is the option of setting the display off, backlight, calibration display or automatic logout. The graphic terminal is equipped with one RJ-45 connector, which can be configured in the network part of the settings in the following range:

Use DHCP – in this case will be network setting assigned automaticly from DHCP,

MAC Address – unique physical address. Here switch the port for configuration,

IP address – IP address of selected port, etc. 192.168.1.45,

Subnet mask – the mask determines from which part of the IP address the subnet starts e.g. 255.255.255.0 for site 192.168.1.0 / 24,

Default gateway – IP address of nearest router, which control the communication to other networks,

DNS – IP addres of DNS server.

User profile

By checking **User profile** the settings are changed from the default configuration (as defined in the definition file) to the user profile, entered in the previous menu item. The application then searches for the PLCs at the IP addresses and ports as entered in the User profile rather than as specified in the definition file.

About

Displays application version and other information.

Exit

The application is terminated, and all connections to PLCs are released. No data are transmitted not received in the background. If the application is not terminated and just set to background, depending on the operating system used there may be data transmission even if the application is not in the foreground. Please exit the application in the Exit menu after you finish your work, also for safety reasons.

The menu is displayed after clicking the Menu icon (see the icons table). The application saves the settings and configurations. If a definition file is read, some of the settings are deleted and set to their defaults. An exception is the Application access password. This is saved until the user enters a new password.

Why use the User profile ?

In certain situations, the mobile device is connected into two different environments: internal network, where also the PLCs are, and the internet. It may be that the router settings is blocking the internal network access if the mobile device is configured so as to connect to the internet from the internal network. The Merbon Visual has dual settings option: the basic setting assumes that the PLC is available in the internal network, while the external setting accesses the PLC over the external IP address of the router which must have its external TCP port 12346 mapped to the TCP port 12346 of the PLC. If the mobile device roams between internal network and the internet, just switch to External settings and back, the IP address configuration needs not to be changed.

Definition of the external IP address:

- select the connection in the menu,

- enter the IP address, port number, user name and other connection data,

- the Password item may be blank – then the password is not changed. If a new password is entered, the existing password will be changed to the new one,

- save the configuration.

The Password is used to open the application. If a password is entered, then this function is active, and to open the application, the valid password must be entered. If the password is empty, the application is not protected.

It is recommended to protect the mobile device by a central PIN code or by a biometric protection for enhanced security.

Problems and solutions

After the application start, Menu definition missing is displayed

There is no menu definition file present. The file must be created in the HMI Editor, copied to the mobile device, and opened in Merbon Visual, see above: **Menu, Open**

Menu is displayed, but it reads Timeout rather than the values

The application did not succeed to establish the connection to the PLC. Check if in the selected profile (**menu Settings, Definition file / User profile**) the address, port, password, and other parameters are properly defined.

Values are displayed but can not be changed

Make sure that your connection credentials (user name and password) are those with the correct access rights (for the SSCP protocol).

Error messages and their meaning

Connection definition missing – PLC connection parameters in the definition file not specified – check the connection settings

Send data to PLC error – Communication error while setting value on the PLC – check internet connection:

- GUID for the setting attribute missing
- Wrong connection ID settings for this attribute
- No attributes available at the specified channel
- No network settings for this network ID

Send data error – Application error when sending data to PLC (Critical application error, repeat action and contact your supplier if necessary)

Data update error – Application error when reading data from PLC (Critical application error, repeat action and contact your supplier if necessary)

Read value error – Read value is an empty field – value for the given attributeis not in the returned value of the PLC – menu definition must be corrected

Value type error – Error of value type of the read variable (different attribute type than defined) – correct the menu definition please

Value conversion error – Read value from PLC can not be transformed to the required (configured) type – correct the menu definition please

Send request error [<connection id>] – Error when sending the request to network. Possible reasons: disconnected network card or lost internet connection

Unknown protocol – Unsupported communication protocol – correct the menu definition please

Unknown type – Unsupported time scheduler type – correct the menu definition please

User login error [<user name>] – Wrong user name or password when logging to the PLC – check connection settings

No connection [<connection id>] – Device (PLC) at the given IP address is not available – check internet connection settings and router settings at the PLC

Timeout [<connection id>] – The PLC did not respond in a specified time

Not found [<connection id>] – No such attribute at the PLC – correct the menu definition please

Break – PLC communication interrupted by user

Unknown [<connection id>] – Error is not in the list – please contact your supplier.