Web-based HMI for REXYGEN

User guide

REX Controls s.r.o.

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Plzeň (Pilsen), Czech Republic

Contents

Chapter 1

Introduction

RexHMI covers all tools and libraries necessary for creating human-machine interfaces (visualizations) for the REXYGEN system. There are three different types of visualization: the WebWatch, the WebBuDi, and the one created by REXYGEN HMI Designer.

- REXYGEN HMI Designer(Chapter 2) creates a standard SVG file with the *RexHMI* extensions. The REXYGEN HMI Designer is a great tool for creating graphical HMI suitable for operators and other end users.
- WebBuDi(Chapter 3), which is an acronym for Web Buttons and Displays, is a simple JavaScript file with several declarative blocks that describe data points to which the HMI is connected to and assemble a table in which all the data is presented. It provides a textual interaction with selected signals and is suitable for system developers and integrators. It may also serve as a fall-back mode HMI for non-standard situations.
- WebWatch(Chapter 5) is an auto-generated HMI from the REXYGEN Studio development tool during project compilation. The development of this HMI has been frozen, and it will not receive new functions. Use watch mode in REXYGEN Studio instead.

All the tools result in the HTML5 web page served from the internal REXYGEN web server. The HMI can be accessed using desktops, tablets, and mobile devices. Recommended web browsers are **Google Chrome Microsoft Edge** and **Mozilla Firefox**. The HMI is based on HTML5, CSS3, JavaScript, and WebSockets.

The HMI is downloaded to the target device using *HMI* block in the *exec.mdl* file. In the project directory, create *exec.mdl* file (or use predefined templates from the Start-up wizard). Add the *HMI* block to the executive, set the *IncludeHMI* parameter, and create your custom HMI screen using either *HMI Desiger* or *WebBuDi*. Once configured, the visualization is downloaded using *Compile and Download* function in the REXYGEN Studio design tool to the target device. The HMI is accessible from the internal server of the target device, for example at `http://192.168.1.100:8008/hmi`.

The URL can include additional parameters to influence the behavior of the HMI:

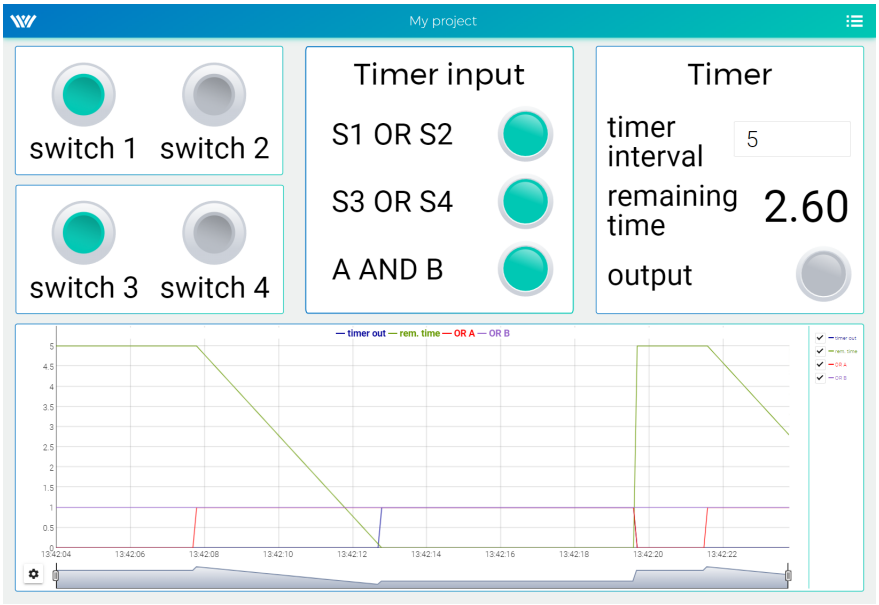


Figure 1.1: The example of visualization from *HMI Designer*

- virtualKeyboard - Activating virtual keyboard on devices with a touchscreen. Used typically on panel PCs powered by Linux, where the operating system does not provide such a feature natively.
- noLogout - Hiding the *Logout* link. Typically used in devices operating in kiosk mode.

Example: `http://192.168.1.100:8008/hmi/index.html?virtualKeyboard=true&noLogout=true`

For special cases, the user can create their own HMI based on JavaScript and custom HTML or SVG components. For that purpose, the *REX.HMI* function library is available. Chapter 4 describes all functions with parameters.

1.1 Build configuration

The HMI is built from the source files in `hmisrc` directory and compiled to `hmi`. Users can change the directory names in the *HMI* block parameters.

The HMI is generated from the `*.hmi.[svg, js, html]` files depending on the selected HMI type. Users can adjust build parameters using a JSON configuration file named `hmi.json`. This configuration file MUST be saved in the `hmisrc` directory. When found, it is used during the compilation time of the whole project. The `hmi.json` file has a predefined structure. The latest version of the structure is shipped with the REXYGEN Studio. The comments in the `hmi.json` are prefixed with underscore. The HMI compiler requires a valid JSON file.

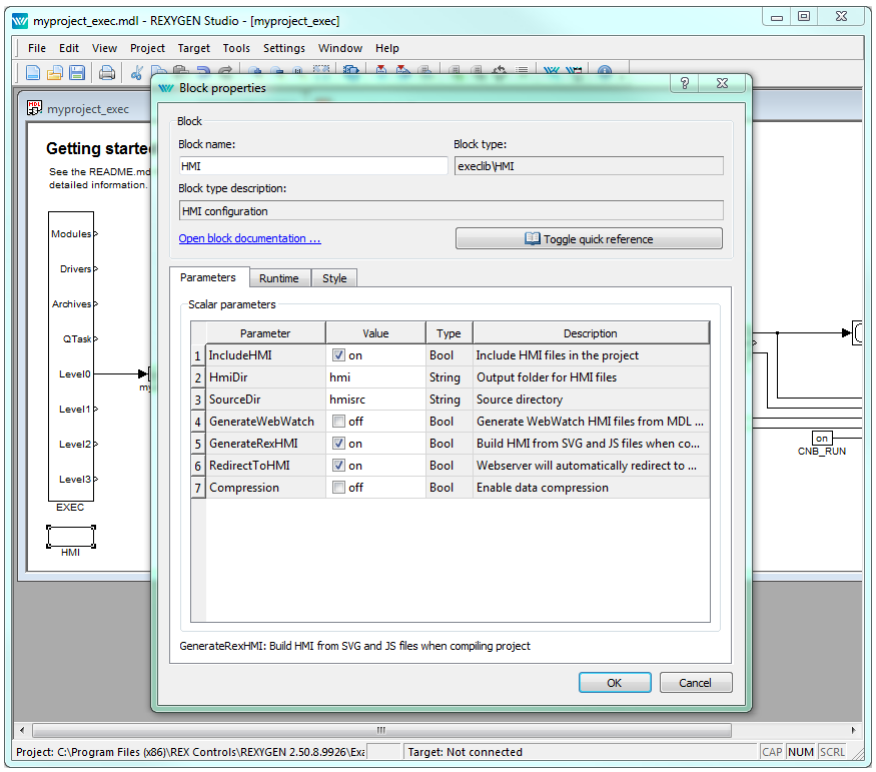


Figure 1.2: Configuration of the *HMI* block in REXYGEN Studio

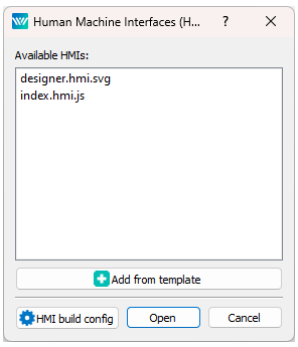


Figure 1.3: Special configuration of the *HMI* block

Chapter 2

REXYGEN HMI Designer

2.1 A Graphical Designer of Web HMI

REXYGEN HMI Designer[1] is tool for designing the custom visualizations using predefined components. The whole HMI is stored in the SVG (Scalable Vector Graphics) file with REXYGEN specific extensions.

When the visualization is ready the HTML page with all necessary libraries is generated. Such a webpage can be easily generated and downloaded to the target device from *./hmi* directory using *Compile and Download* function of the REXYGEN Studio development tool.

Each HMI scheme composes from several components which are connected to the signals from the control system. These components are organized in libraries. The example HMI on fig. 2.1 contain one *Button*, two *LEDs* and several *GeneralComponents* for pool and flower animations.

The HMI components are controlled via extensions (on fig. 2.2) which edit the REXYGEN HMI specific parameters and allow the export of the final HMI. There are following extensions:

- **Browse Components Library** (Ctrl + L) – Open the folder with all available components. Each component is stored as a SVG file which can be drag&dropped to the current HMI
- **Edit Component** (Ctrl + E) – Open edit window for the selected component or for the whole project if nothing is selected.
- **Edit HMI Config** – Open edit window for the general HMI configuration.
- **Export HMI** (Ctrl + H) – Exports the content of the SVG file to the HTML5 webpage with all necessary libraries. This extension is configured via parameters of the whole project.

[1] The REXYGEN HMI Designer is build on the well-known SVG editor Inkscape™ https://inkscape.org/en/.

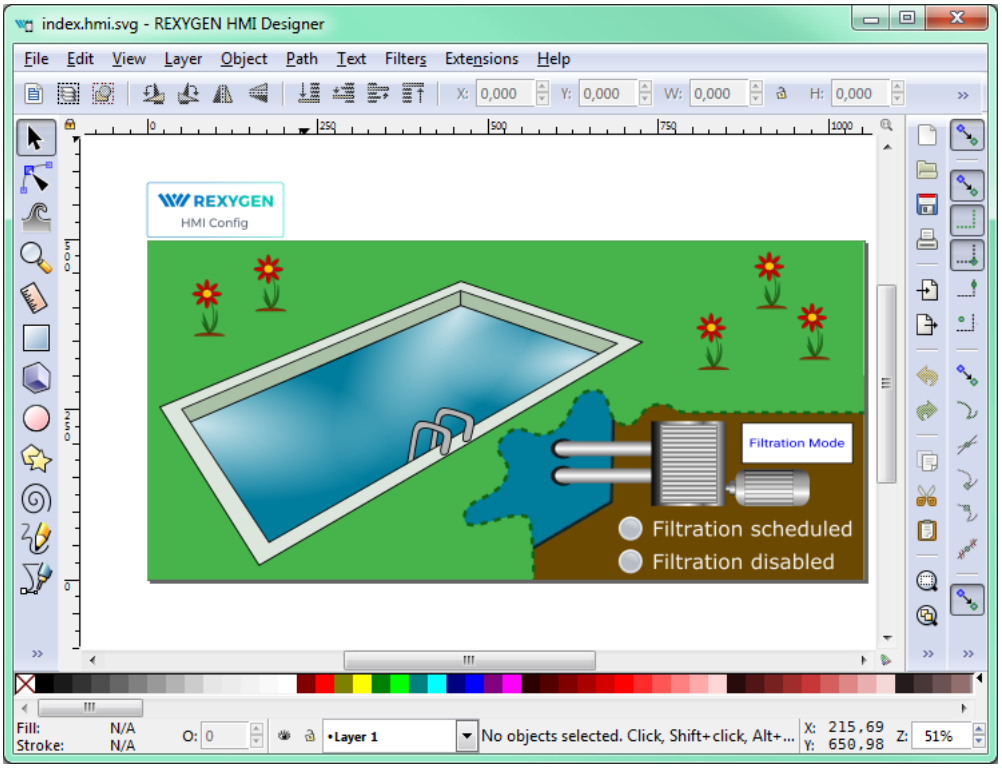


Figure 2.1: The example of REXYGEN HMI Designer visualization

- **Group Animation** (Ctrl + J) – Enable animation of the transformations (translation, rotation, scale), opacity or color of the selected object (SVG group) based on the values from the control system. Or you can use the extension to create clickable button.
- **Purify** – Finds all invalid component in the document a removes them. The component is invalid either if does not contain any valid JSON configuration or visible content like rectangles, texts, etc.
- **Update Components** – Extension for updating the schema to new version
- **Version Info** – Show current version of the REXYGEN HMI Designer and HMI tools.

2.2 General configuration of the HMI

Every custom visualization created using REXYGEN HMI Designer must contain general configuration which is stored in the HMI Config element. The element is added automatically with new document or after first use of *Edit Component* extension. The general

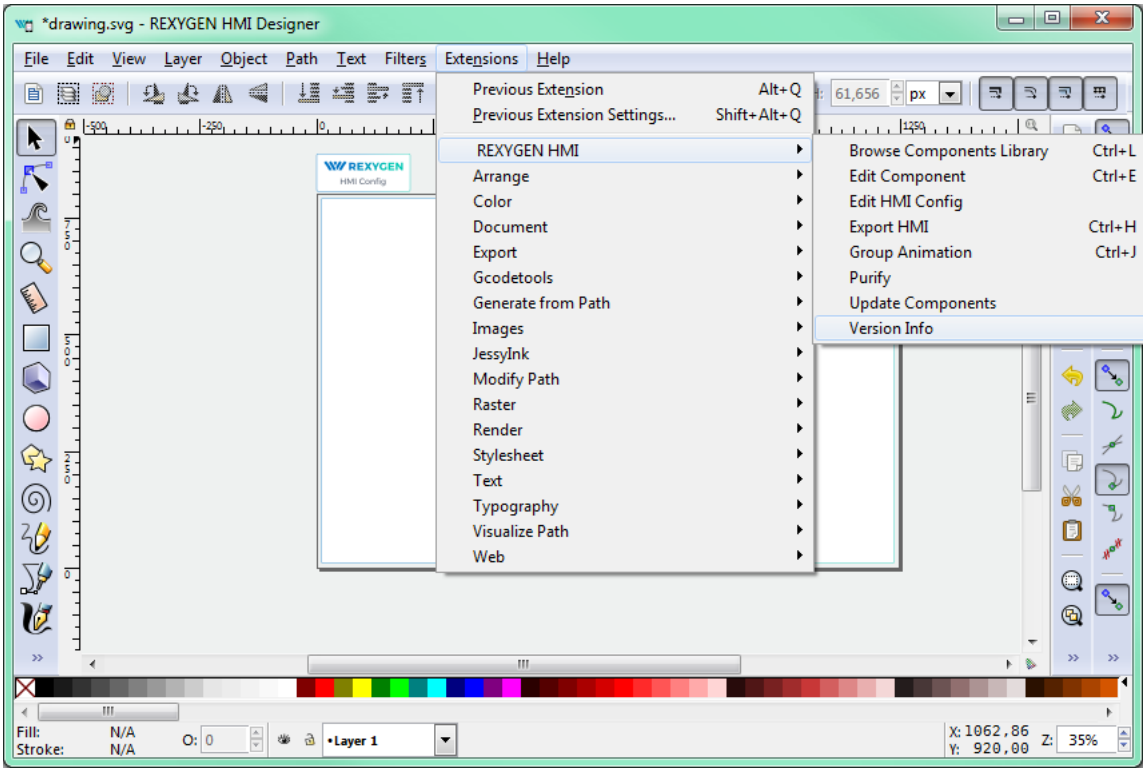


Figure 2.2: The list of RexHMI extensions

configuration consists of three sections

- *Connections* - The list of connections between the HMI and REXYGEN.
- *Options* - General options for the HMI. See the subsection 2.4.1 for all available options.
- *HMTL export* - Configuration of the HTML export.

2.2.1 Connections tab

The connection tab contains table maps between an *Alias* (the name of the data point in HMI) and connection string (the path where the value is read or written form the REXYGEN). Each connection can have one of two types:

- *R* – Read item, the values are read from the target,
- *W* – Write item, the value can be written to the target after change.

There are two more special types the

- *L* – Local item,

- *X* – Expression item (will be described later).

When the HMI Config is opened the *Aliases* of the data points used in the HMI components are loaded automatically. Also the *R* or *W* type is selected based on the type of the component (e.g. The Button `value` data point will point to the *W*rite connection, but Led `value` will point to the *R*ead one). For these connections just use the browse function to fill the connection string.

Press *Browse* button. The login dialog will be opened. Unless you changed the login credentials, use the default username `admin` with an empty password. After a successful login the connection tab is expanded with a tree-view of the running algorithm. Select *Connection String* field of the selected *Alias* and afterwards browse the tree to the desired block and **double-click** the parameter. The connection string of the parameter is copied to the alias. Follow this procedure to fill all the *R* and *W* connections. For basic example see [1].

The Local connection type (*L*) represents a variable. User can define custom item which can be read or written using standard HMI components. The default value is set using *Connection string* field. The *Local* item is available only for current webpage. So if you refresh the webpage or open new one in different tab the default value is loaded.

The Expression connection type (*X*) is used for evaluation expression above other aliases. The alias is read only and updates whenever any of the selected items change. The alias name used in the expression is surrounded by curly brackets. For example:

```
not {ALIAS}; {ALIAS-1} + {ALIAS-2}; 2*{ALIAS-1} + 5
```

The available operations are:

- *Arithmetic* – `+`, `-`, `*`, `/`, `%`
- *Bitwise* – not (`~`), and (`&`), or (`|`), xor (`^|`)
- *Shift* – left (`<<`), right (`>>`), right logical (`>>>`)
- *Logical* – `not`, `and`, `or`, `xor`
- *Relations* – `==`, `!=`, `<`, `>`, `<=`, `>=`
- *Constants* – `pi`, `e`, `true`, `false`, `null`

The expression can point to item type. It can contain constants such as numbers or strings. The type of value is set based on the type of value from used connection. If the expression cannot be evaluated, you will se error log message in the HMI webpage. You can also use expression to concat strings. The example of simple usage of local and expression types is shown in the following figure 2.3.

Note: If expression item points to another expression item the target item MUST be always defined before. The items are sorted alphabetically based on the used *Alias* so the target item must have proper name.

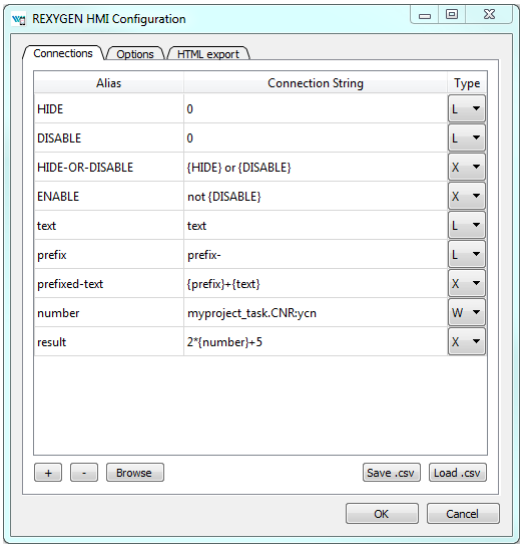


Figure 2.3: Example of using local and expression connection types.

2.2.2 Options tab

See the subsection 2.4.1 for all available options.

2.2.3 HTML Export tab

There are two levels of the HTML export configuration. Basic level allows user to change title of the webpage and title in header of the webpage. Also it is possible to disable generation of tooltips.

When the *Expert mode* is activated user can change following advance options:

- *Build config file path* – For advanced purposes.
- *Create viewbox* – If selected the SVG document fits into the viewbox of the rendered webpage. The aspect ration is preserved. If the option is unselected the SVG size is not changed so only part of the document can be visible and the scrollbar can be shown.
- *User library Path* – Each HMI component uses combination of SVG file and javascript resources. The default libraries are included to the project automatically if the *Library Path* table is empty. If not user must select directory paths where resources for HMI components are located. The path check during HTML export is following:
  - *Absolute path* – If the path is absolute just use it or show error if not directory.

- *Relative path, exclude default libraries is not selected* – Check if the string in the library path is not same as Default library name. If so use the default library. If not check if exist and use it otherwise show error.
- *Relative path, exclude default libraries is selected* – During HTML export check if the directory on the relative path exist otherwise show an error.

2.3 REXYGEN HMI Designer extensions

2.3.1 Group animation

Group animation extension allow to turn SVG group into custom HMI component. At first draw some shape or group several elements together using *Ctrl + G* shortcut. Then open the *Group Animation* extension using *Ctrl + J*. Now there are several choices:

- *Translate X* – Move selected group in the X direction based on the signal from chosen datapoint.
- *Translate Y* – Move selected group in the Y direction based on the signal from chosen datapoint.
- *Rotate* – Rotate selected group around the rotation center selected in the group before the extension was called. The rotation is set from the signal from chosen datapoint.
- *Scale* – Scale selected in chosen direction based on the signal from chosen datapoint.
- *Opacity* – Change opacity of the whole group based on the signal from chosen datapoint.
- *Change Color* – Change fill or stroke color based on the signal from chosen datapoint.
- *Turn group into a button* – Create custom clickable button which has same parameters and behavior as the *Button* component.
- *Import content of the group from external file* – Import content of the group from external `*.svg` file. During the build all the items from HMIConfig are merged with the datapoints defined on the external files. Also nesting external files is supported.
- *Detach group to standalone dialog* – Dialog component allows detaching the content of the group as standalone dialog. The dialog can be shown using `hide_by` datapoint. The dialog is show in the layer above the default cavas. The dialog is only way how to stack several HTML Components like Input and Button. The dialog can be combinated with ExternalFile so the content can be aloaded from external file.

Note: The group can be either button or have a several group animations.

When all the wanted animations are checked, just press OK to create the custom component. From now on the parameters of the component are now editable using *Element Editor* extension. If some of the animation is not wanted anymore you can just open the group animation extension again and change your choice.

2.3.2 Update Components

Update Component extension will check all the components in the current file and compare them between the version in the library. If the version is different it will propose the type of the upgrade. We have three types:

- *None* – Do nothing.
- *Partial* – Change metadata and copy parameters, do not touch underlying SVG.
- *Full* – Upgrade whole component SVG and metadata.

The upgrade algorithm will choose the best upgrade option for you.

2.4 List of available components

There are several predefined HMI components in the component library. Every component is represented as one SVG file which can be drag&drop to the current visualization scheme. The library is divided to five main groups:

- `GENERAL` - Set of common components like buttons, inputs, sliders, gauges for visualization of basic variables.
- `HOME` - Set of components for home automation, like various pipes, valves, radiators, boilers and more.
- `HVAC` - Specialized library for heating, ventilation and air conditioning visualizations.
- `CHARTS` - Specialized library for various charts.
- `PROC` - Specialized library for process control visualizations.

Every component has some data points which provide the interaction between live data and state of the HMI. Mostly you can find:

- `value` - the main data point where value is read or written,
- `disable_by` - the component is disabled when connected to non-zero value,
- `hide_by` - the component is hidden when connected to non-zero value.

and various options which are described in the following text. The components are sort alphabetically.

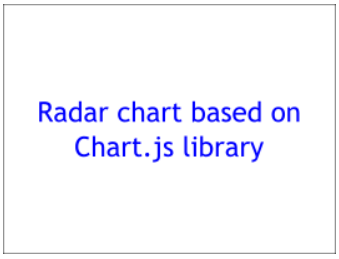
2.4.1 HMIConfig

Global REXYGEN HMI configuration component. User can change project options, configure the HTML export and define list of connections between REXYGEN target and HMI.

Options	Type	Description
`refresh_rate`	int	Changes the default read refresh rate of the whole HMI. Default 500ms
`log_level`	enum	Set the global log level for whole RexHMI. The log messages are written both to the right upper corner menu and to the web browser console. Default level is INFO.
`show_clock`	bool	If True the clock are shown in the right upper corner of the template instead of blinking square. If the target is connected the clock are updated if connection get error o lost the time stops.
`use_client_time`	bool	If True the `show_clock` display the time from client computer rather then target. This can be use when target device does not have NTP synchronization or RTC chip.
`header_mode`	enum	Change the default size of the header (thin, packed). If packed click on the logo to show the header.
`kiosk_mode`	bool	If True the links from header (from logo and header) are removed and user can not change the refresh rate and target.
`target_url`	str	The URL of the target device. So far only the WebSocket protocol is supported. The URL must also contain the PORT, but the protocol can be omitted. Default is empty string which means ws://127.0.0.1:8008 Examples: 192.168.1.100:8008 or wss://192.168.1.100:8009 *Note: If the HMI is hosted on the internal web server this option is ignored and HMI connects to the hostname / IP you use in the webbrowser URL.*

2.4.2 CHARTS

RadarChart



Radar chart based on the Chart.js library.

Data points	Optional	Description
`values`		An array of signals.
`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
Options	**Type**	**Description**
`chartJsOptions`	object	Custom options for Chart.js library. See https://www.chartjs.org for more info.
`min`	int	Axis min
`max`	int	Axis max
`step`	int	Angle between two samples [deg]
`labelStep`	int	The number of steps when label will be generated.

XYChart

XY chart based on the Chart.js library. The signals are read from a TRND(V) block or an array. Each two signals are used as X and Y coordinates for each signal.

Data points	Optional	Description
`values`		An array of XY data in columns or link to TRND block.
`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`reset_by`	True	If non-zero the data in chart are cleared.

Options	Type	Description
`title`	str	Chart title
`signals`	table	Table of signal labels. Write labels in the same order as you connect the signals to the Array or TRND block.
`bufferSize`	int	Applicable only if connected to TRND block. Maximum number of stored samples. If -1 the number of samples is read from TRND block configuration.
`hideLegend`	bool	If true the legend is hidden.
`showLines`	bool	If true the XY points are connected using line.
`xAxis`	table	Table of basic parameters for X axis. Only first row is used!
`yAxis`	table	Table of basic parameters for Y axis. Only first row is used!
`chartJsOptions`	object	Custom options for Chart.js library. See https://www.chartjs.org for more info.

2.4.3 GENERAL

AlarmsTable

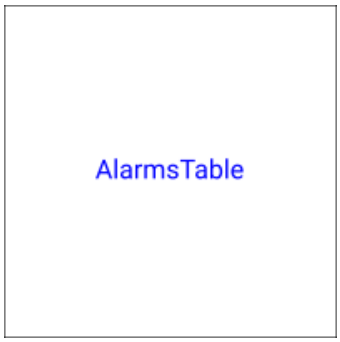


Table component which shows active alarms from the internal REXYGEN alarms subsystem.

Options	Type	Description
`columns`	array	Define visible columns for the alarm table. The columns are shown according to the order of appearance in the array.
`fontScale`	float	Use this parameter to scale font.
`timeFormat`	string	Date time format of the shown timestamp. See luxon.js for more details.

BarGraph

Bargraph component which draw scale on the left side and contain color zones and current value display

Data points	Optional	Description
`value`		Displayed value
`disable_by`	True	If non-zero the component is disabled.
`hide_by`	True	If non-zero the component is hidden.
Options	**Type**	**Description**
`rangeMin`	float	Lower limit for the bargraph value
`rangeMax`	float	Upper limit for the bargraph value
`tickStep`	float	Value for small tick step between main tick steps.
`mainTickStep`	float	Value for main axis tick steps
`decimals`	float	How many decimal figures are displayed
`units`	str	Text which is displayed on the bottom of the bargraph. Usually the name of units.
`colorZones`	table	User can define several color zones which can represent some level of warning. The zones are displayed on the right side of the bargraph. Each has a custom color and range defined by `startValue` and `endValue`. Just double click the `colorZones` and change them in table.
`colorOffLimits`	color	The border color of the bargraph when the value is of `rangeMin` and `rangeMax` limits.
`levelColor1`	color	Change the main bargraph gradient color
`levelColor2`	color	Change the supplementary bargraph gradient color

Battery

Show battery level from 0 to 100 %.

Data points	Optional	Description
`value`		Battery level from 0 to 100
Options	Type	Description

Button

The Button component changes the boolean value. Normally the ON state means TRUE value and OFF mean FALSE value. If needed the parameter `reverseMeaning` switches the written values.
There are three different modes of operation:
`PushButton` when press or touched the ON state is written to the target `value` datapoint. When released the OFF state is written.
`ManualPulse` Always write TRUE value after button is pressed, release is ignored (Suitable for MP block control).
`ToggleButton` When button is pressed the value is toggled (ON -> OFF -> ON).

Data points	Optional	Description
`value`		The main datapoint where boolean value is written.
`refresh_from`	True	If set the state of the component is updated based on the value read from this datapoint. Otherwise the value from main datapoint is used.
`disable_by`	True	If non-zero the component is disabled.
`hide_by`	True	If non-zero the component is hidden.
`readonly_by`	True	If non-zero the component will change once to read-only mode.

Options	Type	Description
`type`	enum	Changes the type of the Button. `PushButton` when press or touched the ON state is written to the target `value` datapoint. When released the OFF state is written. `ManualPulse` writes TRUE value once after button is pressed, release is ignored. `ManualPulseRpt` writes TRUE value periodically (20 ms period) after button is pressed, release stops writing.(Suitable for MP block control) `ToggleButton` when button is pressed the value is toggled (ON -> OFF -> ON).
`reverseMeaning`	bool	If True the meaning of the value is switched. So the ON state is False and OFF state is True.
`fontScale`	float	Use this parameter to scale font because the button is using HTML button component which is not binded with SVG.
`labelFalse`	str	Button label when the state is OFF
`labelTrue`	str	Button label when the state is ON. If not defined the `labelFalse` is used.
`colorFalse`	color	Button background color when the state is OFF
`colorTrue`	color	Button background color when the state is ON
`labelColorFalse`	color	Label (text) color when the state is OFF.
`labelColorTrue`	color	Label (text) color when the state is ON
`writePerm`	table	List of logins who are allowed to write to the data point. If not in list the Button will be disabled.

Checkbox

Checkbox.svg

Data points	Optional	Description
`value`		Datapoint where boolean value is written.
`refresh_from`	True	If set the state of the component is updated based on the value read from this datapoint. Otherwise the value from main datapoint is used.
`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.

`readonly_by`	True	If non-zero the component will change once to read-only mode.

Options	Type	Description
`reverse_meaning`	bool	If True the meaning of the value is switched. So the ON state is False and OFF state is True.
`show_cross`	bool	If True the cross is shown in case of OFF value.

ComboBox

Combobox allow to choose item (value) from predefine list. If the value in the control system is not in the list it is automatically added.

Data points	Optional	Description
`value`		Datapoint where values are written after select.
`refresh_from`	True	If set the state of the component is updated based on the value read from this datapoint. Otherwise the value from main datapoint is used.
`values`	True	Datapoint which point to list of value/descriptions separated by | eg. `0: NOK | 1: OK` (typicaly `pupstr` parameter of CNE block). If set the `values` parameter is ignored.
`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled.
`readonly_by`	True	If non-zero the component will change once to read-only mode.

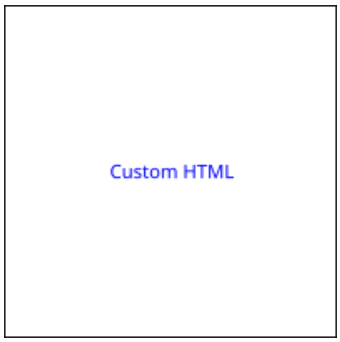
Options	Type	Description
`values`	table	Define value:desc pairs for the combobox list. `Value` is number or string and `desc` is it's string description.
`showValue`	bool	If True the values are shown in the list eg. `0:OK`
`valueType`	enum	Choose if the value is read as a number or string.
`fontScale`	float	Use this parameter to scale the font because the Combobox is using HTML select component which is not binded with SVG.
`writePerm`	table	List of logins who are allowed to write to the data point. If not in list the ComboBox will be disabled.

ControlLed

Simple boolean state indicator. Empty or Zero mean OFF, otherwise ON.

Data points	Optional	Description
`value`		Datapoint from which the LED state is read.
`disable_by`	True	If non-zero the component is disabled.
`hide_by`	True	If non-zero the component is hidden.
Options	**Type**	**Description**
`reverseMeaning`	bool	If True the meaning of the value is switched. So the ON state is False and OFF state is True.
`color_true`	color	The ON state color.
`color_false`	color	The OFF state color.

CustomHTML



CustomHTML component allows inserting custom HTML to the HMI. It creates empty DIV element which is filled with content from the `html` parameter. It can be used for example for including the live camera feed.

Options	Type	Description
`html`	str	Custom HTML content which is insert directly to the HMI.

Display

X.XX

Display component shows value from the target system as a string. It can be either `number`, `date`, `datetime` or simple value as a `text` string depending on the `format` property. Each display can have `units` which are shown at the end of the displayed string.

Data points	Optional	Description
`value`		Datapoint from which the value is read.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	**Type**	**Description**
`format`	enum	`number` - If selected the read value is converted to the number either integer or float. Also the parameters `scale`,`offset` and `decimals` are applied during conversion. The color of the text depends on the `color` property if the value is higher than `rangeMax` the `colorAbove` is used likewise if the value is lower than `rangeMin` the `colorBelow` is applied. `time` and `datetime` - The display will convert read value in milliseconds from REXYGEN Epoch to the current time or datetime. The property `text_format` is applied in this context where the format of the displayed time can be selected. `text` - Simple show the value in the format as was received. Suitable for short strings.
`text_format`	enum	Select the format of the time string for `time` and `datetime`.
`scale`	float	Scale the read value. Applicable for `number` format only.
`offset`	float	Add some offset to the read value. Applicable for `number` format only.
`decimals`	int	Round the read value to defined number of decimals. Applicable for `number` format only.
`color`	color	Normal font color of the display. Applicable for `number` format only.
`colorAbove`	color	Font color of the display when the read value is above `rangeMax`. Applicable for `number` format only.

`colorBelow`	color	Font color of the display when the read value is below `rangeMin`. Applicable for `number` format only.
`rangeMax`	float	When the read value is above `rangeMax` the `colorAbove` color is applied to the font. Applicable for `number` format only.
`rangeMin`	float	When the read value is below `rangeMin` the `colorBelow` color is applied to the font. Applicable for `number` format only.
`units`	str	Append some string to the end of the displayed value. Usually the name of the units.

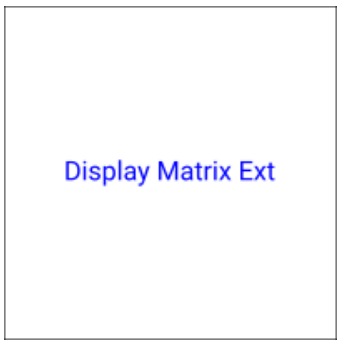
DisplayMatrix

Display Matrix show arbitrary array from target. Just point `value` datapoint to array. For example `CNA:acn` or `MX_MAT:ay`.

Data points	Optional	Description
`value`		The value from the datapoint will be show as a matrix.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	**Type**	**Description**
`transpose`	bool	If True display the transposed matrix.
`fontScale`	float	Use this parameter to scale font.
`decimals`	int	Round the cell value to defined number of decimals.
`header`	table	Table header, an array of string labels for each column.
`showLineNumbers`	bool	If True the line number will be added to the first column.
`divClass`	string	Custom CSS class for components main DIV element. Space separated string list.

`tableClass`	string	Custom CSS class for HTML table element. Space separated string list.

DisplayMatrixExt



Display Matrix show arbitrary array from target. Just point `value` datapoint to array. For example `CNA:acn` or `MX_MAT:ay`.

Data points	Optional	Description
`value`		The value from the datapoint will be show as a matrix.
`row`		If non zero, the row will be selected.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	**Type**	**Description**
`transpose`	bool	If True display the transposed matrix.
`fontScale`	float	Use this parameter to scale font.
`decimals`	int	Round the cell value to defined number of decimals.
`header`	table	Table header, an array of string labels for each column.
`showLineNumbers`	bool	If True the line number will be added to the first column.
`divClass`	string	Custom CSS class for components main DIV element. Space separated string list.
`tableClass`	string	Custom CSS class for HTML table element. Space separated string list.
`transformFcn`	string	This body of the function will be evaluated as ‘function transform(row,column,value)‘ and expect ‘value‘ as result.

DisplayString

XXX DISPLAY STRING XXX

The Display string component reads the value from the target and display it as a text. It can simply display the read value `format`: `text` or lookup the value in the table `alt` (alternative lookup table) of descriptions.
Note:If the value contains newline sign the text is wrapped.

Data points	Optional	Description
`value`		Datapoint from which the value is read.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	**Type**	**Description**
`format`	enum	`text` - show the read value as is. `alt` - Lookup the description for the read value in the `values` list. If not found display the value as is.
`showValue`	bool	If True prepend the value in front of the description separated by colon. Example: `0: Status OK`
`values`	table	List of value:desc pairs where the description is looked up when the value is read.

DisplayWithBox

Display component shows value from the target system as a string. It can be either `number`, `date` or `datetime` string depending on the `format` property. Each display can have `units` which are shown at the bottom of the box.

Data points	Optional	Description
`value`		Datapoint from which the value is read.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	**Type**	**Description**

`format`	enum	`number` - If selected the read value is converted to the number either integer or float. Also the parameters `scale`,`offset` and `decimals` are applied during conversion. The color of the text depends on the `color` property if the value is higher than `rangeMax` the `colorAbove` is used likewise if the value is lower than `rangeMin` the `colorBelow` is applied. `time` and `datetime` - The display will convert read value in milliseconds from REXYGEN Epoch to the current time or datetime.
`scale`	float	Scale the read value. Applicable for `number` format only.
`offset`	float	Add some offset to the read value. Applicable for `number` format only.
`decimals`	int	Round the read value to defined number of decimals. Applicable for `number` format only.
`color`	color	Normal font color of the display. Applicable for `number` format only.
`colorAbove`	color	Font color of the display when the read value is above `rangeMax`. Applicable for `number` format only.
`colorBelow`	color	Font color of the display when the read value is below `rangeMin`. Applicable for `number` format only.
`rangeMax`	float	When the read value is above `rangeMax` the `colorAbove` color is applied to the font. Applicable for `number` format only.
`rangeMin`	float	When the read value is below `rangeMin` the `colorBelow` color is applied to the font. Applicable for `number` format only.
`units`	str	Append some string to the end of the displayed value. Usually the name of the units.

Gauge180

A Gauge displays the read value on the scale using the arm. The range of the scale is limited by `rangeMin` and `rangeMax` parameters. The scale is divided to some main steps using `mainTickStep` parameter and more using `tickStep`. Also the read value is displayed as a number rounded to `decimals`. If the read value is beyond the limits the Gauge's border changes to `colorOffLimits` color. The Gauge also contain special kind of

color scale which is defined by `colorZones` table. For example it can be used for defining the normal, warning and error levels.

Data points	Optional	Description
`value`		Datapoint from which the value is read.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	**Type**	**Description**
`rangeMin`	float	The minimum value for the Gauge scale.
`rangeMax`	float	The maximum value for the Gauge scale.
`tickStep`	float	Draw tick every `tickStep` value to the scale.
`mainTickStep`	float	Draw main tick every `mainTickStep` value to the scale with text description.
`decimals`	float	Round the read value to defined number of decimals.
`units`	str	Name of the units or just text description.
`colorZones`	table	Defines the special scale with color segments starting from `startValue` and ending at `endValue` colored by `color`.
`colorOffLimits`	color	Border color when read value is of the range.

Gauge270

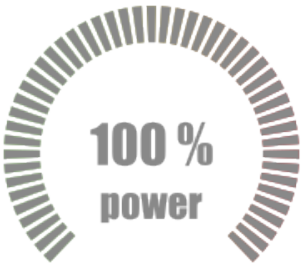
A Gauge displays the read value on the scale using the arm. The range of the scale is limited by `rangeMin` and `rangeMax` parameters. The scale is divided to some main steps using `mainTickStep` parameter and more using `tickStep`. Also the read value is diplayed as a number rounded to `decimals`. If the read value is beyond the limits the Gauge's border changes to `colorOffLimits` color. The Gauge also contain special kind of color scale which is defined by `colorZones` table. For example it can be use for defining the normal, warning and error levels.

Data points	Optional	Description

`value`		Datapoint from which the value is read.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.

Options	Type	Description
`rangeMin`	float	The minimum value for the Gauge scale.
`rangeMax`	float	The maximum value for the Gauge scale.
`tickStep`	float	Draw tick every `tickStep` value to the scale.
`mainTickStep`	float	Draw main tick every `mainTickStep` value to the scale with text description.
`decimals`	float	Round the read value to defined number of decimals.
`units`	str	Name of the units or just text description.
`colorZones`	table	Defines the special scale with color segments starting from `startValue` and ending at `endValue` colored by `color`.
`colorOffLimits`	color	Border color when read value is of the range.

GaugeBars



The GaugeBars component show the current value as a number of highlighted ticks. The value should be between `rangeMin` and `rangeMax`. Also the read value is diplayed as a number rounded to `decimals` with possible `units` string.

Data points	Optional	Description
`value`		Datapoint from which the value is read.

Options	Type	Description
`rangeMin`	float	The minimum value for the Gauge.
`rangeMax`	float	The maximum value for the Gauge.
`decimals`	int	Round the read value to defined number of decimals.
`units`	str	Name of the units or just text description.

GaugeGradient

The GaugeGradient component show the current value as a fill of the arc. The value should be between `rangeMin` and `rangeMax`. The min value means whole arc is red the max value is whole arc is green.

Data points	Optional	Description
`value`		Datapoint from which the value is read.
Options	Type	Description
`rangeMin`	float	The minimum value for the Gauge.
`rangeMax`	float	The maximum value for the Gauge.

ImageChanger

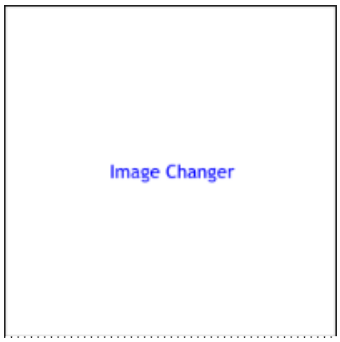


Image Changer component loads image (*.png,*.jpg,*.bmp,*.svg etc.) and displays it inside its boundaries. The image is refreshed when the `refresh_from` datapoint changes or after given `period`. The `imagePath` should be relative to the root of the webserver. If the `appendKey` property is True and the `imagePath` contains `{0}` sign, the sign is replaced using the read value.
Example of the `imagePath /hmi/images/img-{0}.png` and value can change from 0 to 10, etc.

Data points	Optional	Description
`refresh_from`	True	When the value is changed the image is updated.

`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.

Options	Type	Description
`imagePath`	str	Relative path from the webserver root where the image is located.
`appendKey`	bool	If True the `{0}` is replaces with current `refresh_from` value in the `imagePath` property.
`period`	int	If larger than zero the image will be automatically refreshed based on the given `period` in milliseconds. The `refresh_from` datapoint is used only for `appendKey` mode.
`preserveAspectRatio`	enum	Value for the preserveAspectRatio attribute of the SVG image element.

Input

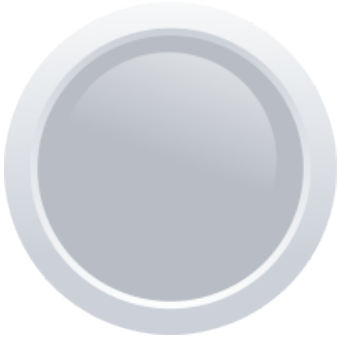
Input component allows to write numbers, texts, dates or times to the target. If the `number` format is selected the value can be converted using `scale` and `offset` adn rounded to number of `decimals`. The Input allows to limit user input to the range defined by `min` and `max` parameters. The `date` and `datetime` format has a special widget to enter the dates. The value from this format is converted to the number of milliseconds from REXYGEN epoch.(`datetime` - 'HH:mm', `datetime-seconds` - 'HH:mm:ss')
The `time` format converts value to numbers of seconds.(`time` - 'HH:mm', `time-seconds` - 'HH:mm:ss')
Note:The value is written to the `value` datapoint, if necessary it can be refresh from different location defined in the `refresh_from` datapoint. It can be used if the value is limited by saturation.

Data points	Optional	Description
`value`		Datapoint where the value is written.
`refresh_from`	True	Optional datapoint where the value is updated.
`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.

`readonly_by`	True	If non-zero the component will change once to read-only mode.

Options	Type	Description
`format`	enum	`number` - If selected the value is converted to the number either integer or float. Also the parameters `scale`,`offset` and `decimals` are applied during conversion. `date` and `datetime` - The input will convert date or datetime to the number of milliseconds from REXYGEN Epoch. `time` - The input will convert time to the number of seconds `text` - Simple enter the value in the format as is. Suitable for short strings. `password` - Text field which shows an asterisks.
`fontScale`	float	The Input is using HTML input component which is not binded with SVG. Use this parameter to scale font.
`textAlign`	enum	The Input is using HTML input component which is not binded with SVG. Use this parameter to scale font.
`scale`	float	Scale the value. Applicable for `number` format only.
`offset`	float	Add some offset to the value. Applicable for `number` format only.
`decimals`	int	Round the value to defined number of decimals. Applicable for `number` format only.
`digits`	int	Total number of digits without decimals. Remaining digits will be filled with zeros. Applicable for `number` format only.
`min`	float	The minimum value user can enter. Applicable for `number` format only.
`max`	float	The maximum value user can enter. Applicable for `number` format only.
`setOnBlur`	bool	If True the data input value is set on blur event (Press ESC to cancel write).
`css`	object	Custom CSS style for the HTML input object. For example `{"background-color":"#00ffff"}`
`writePerm`	table	List of logins who are allowed to write to the data point. If not in list the Input will be disabled.

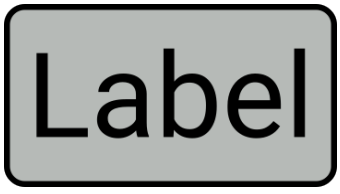
Led



Boolean state indicator. Empty or Zero mean OFF,FALSE, otherwise ON, TRUE. This can be switched using `reverseMeaning` parameter.

Data points	Optional	Description
`value`		Datapoint from which the value is read.
`error_by`	True	If set and TRUE the led will show `colorError`
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	**Type**	**Description**
`reverseMeaning`	bool	If True the meaning of the value is switched. So the ON state is False and OFF state is True.
`colorTrue`	color	LED background color when the signal is ON, ENABLED, ...
`colorFalse`	color	LED background color when the signal is OFF, DISABLED, ...
`colorError`	color	LED background color when the signal error is TRUE.

LedLabel



State indicator with text label. Define states with colors and labels using `values` table. Omit color string if not used (e.g. stroke color)

Data points	Optional	Description
`value`		Datapoint from which the LED state is read.
`hide_by`	True	If non-zero the component is hidden.

`disable_by`	True	If non-zero the component is disabled and data are no longer updated.

Options	Type	Description
`values`	table	List of labels and colors which will be shown when `value` changes. The priority is in asscending order. If any item in the `values` table is empty string, the look will not be changed.
`line_height`	str	Line height of the multiline text used for `dy` tspan attribute. THIS parameter is used if only there is not a sufficient number of tspan nodes.

PushOnOff

The PushOnOff button component changes the boolean value. Normally the ON state means TRUE value and OFF mean FALSE value. If needed the parameter `reverseMeaning` switches the written values.
There are three different modes of operation:
`PushButton` when press or touched the ON state is written to the target `value` datapoint. When released the OFF state is written.
`ManualPulse` always write TRUE value after button is pressed, release is ignored.(Suitable for MP block control)
`ToggleButton` when button is pressed the value is toggled (ON -> OFF -> ON).

Data points	Optional	Description
`value`		Datapoint where boolean value is written.
`refresh_from`	True	If set the state of the component is updated based on the value read from this datapoint. Otherwise the value from main datapoint is used.
`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`readonly_by`	True	If non-zero the component will change once to read-only mode.

Options	Type	Description
`type`	enum	Changes the type of the Button. `PushButton` when press or touched the ON state is written to the target `value` datapoint. When released the OFF state is written. `ManualPulse` writes TRUE value once after button is pressed, release is ignored. `ManualPulseRpt` writes TRUE value periodically (20ms period) after button is pressed, release stops writing.(Suitable for MP block control) `ToggleButton` when button is pressed the value is toggled (ON -> OFF -> ON).
`reverseMeaning`	bool	If True the meaning of the value is switched. So the ON state is False and OFF state is True.
`colorFalse`	color	Button background color when the state is OFF
`colorTrue`	color	Button background color when the state is ON
`writePerm`	table	List of logins who are allowed to write to the data point. If not in list the Button will be disabled.

SimpleLogger

Simple logger component write list of separated lines / logs. It can be used in two modes based on the `format` parameter. Each line can be prepend with `timestamp` using local (client) time. Whole log is limited to the max number of `lines`. Parameter `format` have to options:
`text` - Simply log when the datapoint `value` changes.
`alt` - When datapoint `value` changes the description for the value is look up in `texts` table. If not found the value is logged. The value is prepend to description if `showValue` is enabled.

Data points	Optional	Description
`value`		The value from the datapoint will be logged in the logger.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.

Options	Type	Description

`format`	enum	The format of the logged message. Either pure `text` or `alt` analog value lookup table.
`texts`	table	The lookup table with `value` and description (`desc`) pairs. Available for `alt format`.
`lines`	int	Maximum number of row / lines in the logger.
`showValue`	bool	If True the value is prepend before description from `texts` table.
`ignoreEmptyValues`	bool	If True the logger will ignore all values with no description.
`timestamp`	bool	If True the local client time timestamp will be shown.
`timestampFormat`	enum	String format of the timestamp. See GlobalizeJS library form more formats.
`useTargetTime`	bool	If True the timestamp value is read from the target.
`css`	object	Custom CSS style for the HTML logger as a JSON object. For example `{'background-color':'#00ffff'}`

SliderHorizontal

Slider sets integer or floating value to the target. The range of the slider is limited between the `min` and `max` value. Slider move is split to several `steps`. The `value` can be converted using `scale` and `offset` and rounded to chosen number of `decimals`. The `fontScale` applies to the displayed value. Each slider has a `label`.

Data points	Optional	Description
`value`		The main datapoint where numeric value is written.
`active`	True	If set the slider periodically write boolean TRUE value to the datapoint when the slider is pressed or moving.
`refresh_from`	True	If set the state of the component is updated based on the value read from this datapoint. Otherwise the value from main datapoint is used.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
`readonly_by`	True	If non-zero the component will change once to read-only mode.

Options	Type	Description
`min`	float	The minimum slider value.
`max`	float	The maximum slider value.
`step`	float	The size of step (increment) when slider moves.

`label`	str	The text description.
`fontScale`	float	The fontScale of the displayed value. If set to 1 the font size is default. The floating number above 1 increase the font size.
`scale`	float	Scale the number when read. The equation is scale*val+offset. The number is converted back when written.
`offset`	float	Offset the number when read. The equation is scale*val+offset. The number is converted back when written.
`decimals`	int	Round the number when read.
`writeOnChange`	bool	If true the value is written to the target when the slider is moving.

SliderVertical

Slider sets integer or floating value to the target. The range of the slider is limited between the `min` and `max` value. Slider move is split to several `steps`. The `value` can be converted using `scale` and `offset` and rounded to chosen number of `decimals`. The `fontScale` applies to the displayed value. Each slider has a `label`.

Data points	Optional	Description
`value`		The main datapoint where numeric value is written.
`active`	True	If set the slider periodically write boolean TRUE value to the datapoint when the slider is pressed or moving.
`refresh_from`	True	If set the state of the component is updated based on the value read from this datapoint. Otherwise the value from main datapoint is used.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
`readonly_by`	True	If non-zero the component will change once to read-only mode.

Options	Type	Description
`min`	float	The minimum slider value.
`max`	float	The maximum slider value.
`step`	float	The size of step (increment) when slider moves.
`label`	str	The text description.
`fontScale`	float	The fontScale of the displayed value. If set to 1 the font size is default. The floating number above 1 increase the font size.
`scale`	float	Scale the number when read. The equation is scale*val+offset. The number is converted back when written.
`offset`	float	Offset the number when read. The equation is scale*val+offset. The number is converted back when written.
`decimals`	int	Round the number when read.
`writeOnChange`	bool	If true the value is written to the target when the slider is moving.

Switch

Switch changes the values from the predefine list. Each position write defined value to the target device. Click mouse button or tap to change position clockwise (CW). Double click or double tap to change position counterclockwise (CCW).

Data points	Optional	Description
`value`		Datapoint where value is written.
`refresh_from`	True	If set the state of the component is updated based on the value read from this datapoint. Otherwise the value from main datapoint is used.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
`readonly_by`	True	If non-zero the component will change once to read-only mode.

Options	Type	Description
`positions`	table	List of switch positions with values.
`hideTooltips`	bool	If TRUE the tooltip with values on each position are not shown.

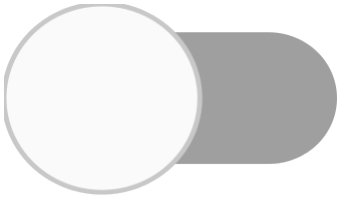
SwitchOnOff

SwitchOnOff.svg

Data points	Optional	Description
`value`		Datapoint where boolean value is written.
`refresh_from`	True	If set the state of the component is updated based on the value read from this datapoint. Otherwise the value from main datapoint is used.
`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`readonly_by`	True	If non-zero the component will change once to read-only mode.

Options	Type	Description
`reverse_meaning`	bool	If True the meaning of the value is switched. So the ON state is False and OFF state is True.
`labelColorFalse`	color	Label (text) color when the state is OFF.
`labelColorTrue`	color	Label (text) color when the state is ON
`writePerm`	table	List of logins who are allowed to write to the data point. If not in list the Button will be disabled.

SwitchOnOff2



The SwitchOnOff component changes the boolean value. Normally the ON state means TRUE value and OFF mean FALSE value. If needed the parameter `reverseMeaning` reverse the written values.

Data points	Optional	Description
`value`		The main datapoint where boolean value is written.
`refresh_from`	True	If set the state of the component is updated based on the value read from this datapoint. Otherwise the value from main datapoint is used.
`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled.
`readonly_by`	True	If non-zero the component will change once to read-only mode.

Options	Type	Description
`reverseMeaning`	bool	If True the meaning of the value is switched. So the ON state is False and OFF state is True.
`label`	str	Text written next to the switch
`writePerm`	table	List of logins who are allowed to write to the data point. If not in list the Button will be disabled.

TRND

The TRND component is used for displaying the signals from the TRND blocks. Simply just set `TRND` datapoint to any parameter of the TRND block eg. `taskname.TRND:u1`. All signals will be displayed in the trend. Each signal can be labeled using `signals` table.

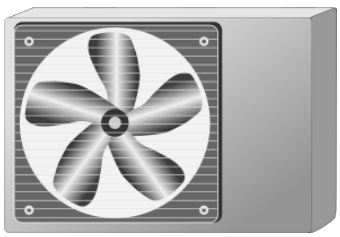
Data points	Optional	Description
`TRND`		Set the datapoint to any parameter of the TRND block eg. `taskname.TRND:u1` to enable reading of all signals.

`ViewConfig`	True	If set the graph configuration is loaded from JSON string. If not the ViewConfig is loaded from TRND block. The configuration is loaded once after the page is loaded. The refresh must be done manually from the menu.
`reset_by`	True	If non-zero the data from trend are deleted.
`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.

Options	Type	Description
`title`	str	Trend title
`signals`	table	Table of signal labels. Write labels in the same order as you connect the signals to the TRND block.
`bufferSize`	int	The size of the buffer in the client web browser. If `-1` the target TRND block buffer size is used. *Note: if the buffer is larger than the buffer on the device the history is lost when the page is refreshed.* *Note: Large buffer can slow your device especially on slower CPUs like RaspberryPi*
`refreshRate`	int	Custom refresh rate of the trend. Normally the trend is refreshed with the HMI main refresh rate period. If needed each trend can have custom one.
`hideLegend`	bool	Hide the legend of the graph.
`hideRangeSelector`	bool	Hide the range selector bellow the graph.
`yAxis`	table	Table of basic parameters for Y axis. Only first row is used!
`dygraphOptions`	object	Custom options for Dygraph library. See http://dygraphs.com/options.html for more info.

2.4.4 HOME

AirCirculator



Data points	Optional	Description
`POWER`		If non-zero the component is enabled.

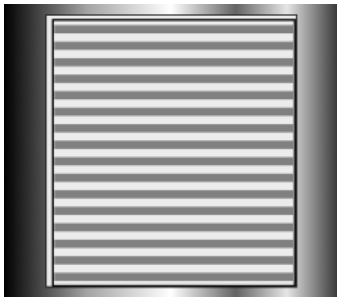
Options	Type	Description
`colorRun`	color	Component color when enabled / running.
`colorStop`	color	Component color when disabled / stopped.

Boiler

The boiler show progress of heating. If the `currentTemp` is less than `setTemp` the flames are visible.

Data points	Optional	Description
`POWER`		If non-zero the component is enabled.
`setTemp`		Boiler temperature set-point.
`currentTemp`		Current temperature.
Options	Type	Description

Filter

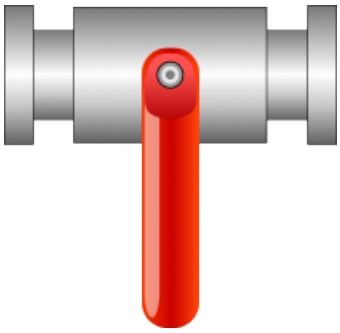


The filter show if filtration is in progress.

Data points	Optional	Description
`POWER`		If non-zero the component is enabled.
Options	Type	Description
`colorOn`	color	Component color when enabled / running.

`colorOff`	color	Component color when disabled / stopped.

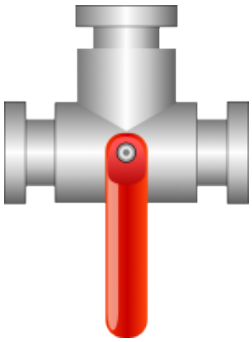
HandleValve



The valve controller. It switch the value when clicked.

Data points	Optional	Description
`FLOW`		State of the valve.
`refresh_from`	True	If set the state is read from this datapoint.
Options	Type	Description

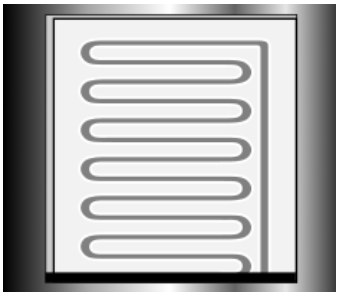
HandleValveT



The three state valve controller. When clicked it toggle two boolean values.

Data points	Optional	Description
`FLOW1`		State of the valve.
`FLOW2`		State of the valve.
`refresh_from`	True	If set the state is read from this datapoint. It expect integer number *0 - unknown, 1 - True-False state, 2 - False-True state.*
Options	Type	Description

Heater



The heater show when the heating is active and what is the current temperature. The color changes from `colorMin` when the value is less than `colorSignalMin` and `colorMax` when the value is greater than `colorSignalMax`.

Data points	Optional	Description
`POWER`		If non-zero the heater is active.
`currentTemp`		Current temperature.
Options	**Type**	**Description**
`heatingColor`	color	The color of the heating spiral when active.
`colorMin`	color	The color of the medium when the current temperature is low.
`colorMax`	color	The color of the medium when the current temperature is high.
`colorSignalMin`	float	The minimum level of the value.
`colorSignalMax`	float	The maximum level of the value.

Motor

The motor status indicator.

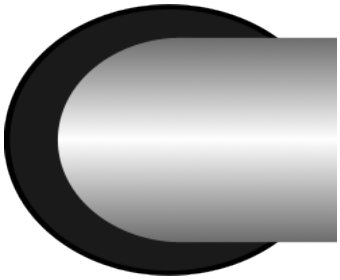
Data points	Optional	Description
`POWER`		If non-zero the motor is active.
Options	**Type**	**Description**
`colorRun`	color	The color when motor is enabled / running.
`colorStop`	color	The color when motor is disabled / stopped.

PipeElbow

The pipe changes the color based on the `COLOR` signal.

Data points	Optional	Description
`COLOR`		The value for color change (e.g. temperature of the pipe)
Options	Type	Description
`colorMin`	color	The color when the current temperature is bellow min.
`colorMax`	color	The color when the current temperature is above max.
`colorSignalMin`	float	The minimum temperature.
`colorSignalMax`	float	The maximum temperature.

PipeEnding



The pipe changes the color based on the `COLOR` signal.

Data points	Optional	Description
`COLOR`		The value for color change (e.g. temperature of the pipe)
Options	Type	Description

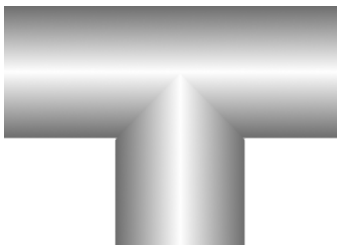
`colorMin`	color	The color when the current temperature is bellow min.
`colorMax`	color	The color when the current temperature is above max.
`colorSignalMin`	float	The minimum temperature.
`colorSignalMax`	float	The maximum temperature.

PipeStraight

The pipe changes the color based on the `COLOR` signal.

Data points	Optional	Description
`COLOR`		The value for color change (e.g. temperature of the pipe)
Options	**Type**	**Description**
`colorMin`	color	The color when the current temperature is bellow min.
`colorMax`	color	The color when the current temperature is above max.
`colorSignalMin`	float	The minimum temperature.
`colorSignalMax`	float	The maximum temperature.

PipeT

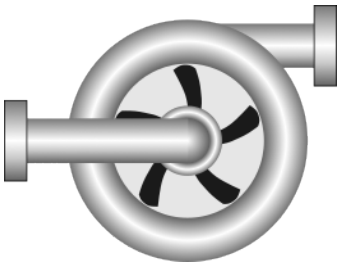


The pipe changes the color based on the `COLOR` signal.

Data points	Optional	Description
`COLOR`		The value for color change (e.g. temperature of the pipe)
Options	**Type**	**Description**
`colorMin`	color	The color when the current temperature is bellow min.

colorMax	color	The color when the current temperature is above max.
colorSignalMin	float	The minimum temperature.
colorSignalMax	float	The maximum temperature.

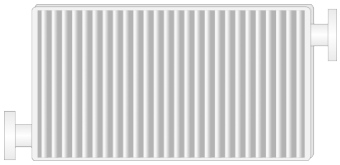
Pump



The pump status indicator.

Data points	Optional	Description
POWER		If non-zero the pump is active.
Options	**Type**	**Description**
colorRun	color	The color when pump is enabled / running.
colorStop	color	The color when pump is disabled / stopped.

Radiator



The radiator status indicator.

Data points	Optional	Description
POWER		If non-zero the heating is active.
currentTemp		Current temperature.
Options	**Type**	**Description**
inOutColor	color	The color of input and output when heating is active.
colorMin	color	The color of the radiator when currentTemp is less than colorSignalMin.
colorMax	color	The color of the radiator when currentTemp is more than colorSignalMax.
colorSignalMin	float	Minimum value of the temperature.

`colorSignalMax`	float	Maximum value of the temperature.

Shower

Shower.svg

Data points	Optional	Description
`POWER`		
Options	Type	Description

WaterBoiler

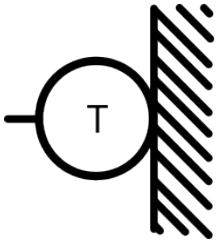
The water boiler component show progress of both heating and cooling. The state depend on `power` value: 1 - heating
0 - none
-1 - cooling

Data points	Optional	Description
`power`		The state of the water boler: 1 - heating 0 - none -1 - cooling

`currentTemp`

Options	Type	Description
`heatingColor`	color	The color of the spiral when boiler is heating.
`coolingColor`	color	The color of the spiral when boiler is cooling.
`colorMax`	color	The color when the current temperature is above max.
`colorMin`	color	The color when the current temperature is bellow min.
`colorSignalMax`	float	The maximum temperature.
`colorSignalMin`	float	The minimum temperature.

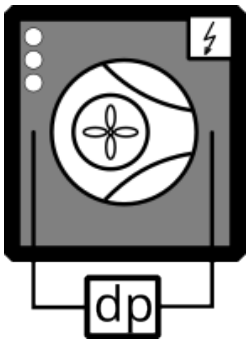
ExternalThermometer



ExternalThermometer.svg

Data points	Optional	Description
`temp`		
Options	Type	Description

Fan



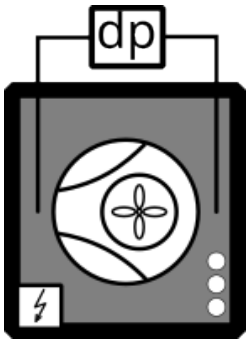
Fan.svg

Data points	Optional	Description
`L1`		

L2	True	
L3	True	
OHEAT		
RUNNING		

Options	Type	Description

FanLeft

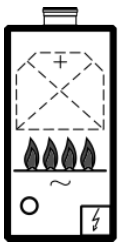


FanLeft.svg

Data points	Optional	Description
L1		
L2	True	
L3	True	
OHEAT		
RUNNING		

Options	Type	Description

GasBoiler

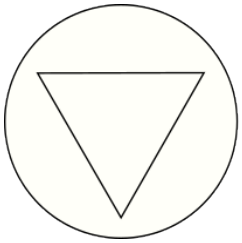


GasBoiler.svg

Data points	Optional	Description
ERROR		
POWER		

Options	Type	Description
flame1_on	float	
flame2_on	float	
flame3_on	float	
flame4_on	float	
flame_color	color	
innerFlame_color	color	
led_color	color	

Pump

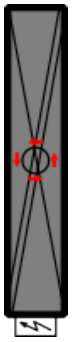


Pump.svg

Data points	Optional	Description
ON		

Options	Type	Description
on_color	color	

RotaryExchanger



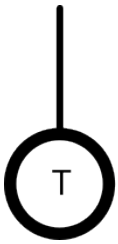
RotaryExchanger.svg

Data points	Optional	Description
ENABLE		
ICE		

`OHEAT`		
`POWER`		

Options	Type	Description

Thermometer



Thermometer.svg

Data points	Optional	Description
`temp`		

Options	Type	Description

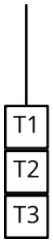
Thermostat

Thermostat.svg

Data points	Optional	Description
`THERM`		

Options	Type	Description

ThermostatThree



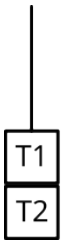
ThermostatThree.svg

Data points	Optional	Description

`THERM`
`THERMTHREE`
`THERMTWO`		

Options	Type	Description

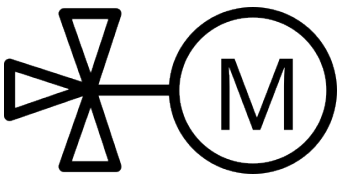
ThermostatTwo



ThermostatTwo.svg

Data points	Optional	Description
`THERM` `THERMTWO`		
Options	Type	Description

TValve



TValve.svg

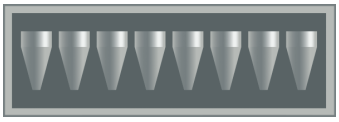
Data points	Optional	Description

`OPEN`

Options	Type	Description
`open_color`	color	

2.4.5 PROC

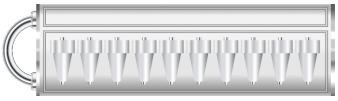
HydroCyclons



HydroCyclons.svg

Data points	Optional	Description
`value`	True	Number of active cyclons
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	Type	Description

HydroCyclons10



Graphical component for Hydrocyclons

Data points	Optional	Description
`active_by`	True	Bitmask which set active color to the relevant cyclone. The lowers bit corresponds with rightest cyclone.
`blocked_by`	True	Bitmask which set blocked color to the relevant cyclone. The lowers bit corresponds with rightest cyclone. The block has higher priority than active.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	Type	Description
`colorActive`	color	Color of the active cyclone.
`colorBlocked`	color	Color of the blocked cyclone.

HydroCyclons2

HydroCyclons2.svg

Data points	Optional	Description
`value`	True	Number of active cyclons.
`hide_by`	True	If non-zero the component is hidden.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
Options	Type	Description

Pump

Pump.svg

Data points	Optional	Description
`active_by`	True	If non-zero the pump is ON
`error_by`	True	If non-zero the pump is in error.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	Type	Description

Reactor

Reactor.svg

Data points	Optional	Description
`value`	True	The height of the level in the tank.
`active_by`	True	If non-zero the reactor is ON
`error_by`	True	If non-zero the reactor is in error.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.
Options	**Type**	**Description**
`valueMin`	float	
`valueMax`	float	

ReactorSmall

ReactorSmall.svg

Data points	Optional	Description
`value`	True	The height of the reactor in the tank.
`active_by`	True	If non-zero the reactor is ON
`error_by`	True	If non-zero the valve is in error.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.

`hide_by`	True	If non-zero the component is hidden.

Options	Type	Description
`valueMin`	float	
`valueMax`	float	

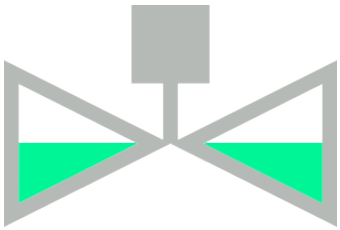
Tank

Tank.svg

Data points	Optional	Description
`value`	True	The height of the level in the tank.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.

Options	Type	Description
`valueMin`	float	
`valueMax`	float	

Valve



Valve.svg

Data points	Optional	Description
`value`	True	The height of the level in the tank.
`active_by`	True	If non-zero the valve is ON
`error_by`	True	If non-zero the valve is in error.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.

Options	Type	Description
`valueMin`	float	
`valueMax`	float	

Valve2

Valve2.svg

Data points	Optional	Description
`value`	True	The height of the level in the tank.
`active_by`	True	If non-zero the valve is ON
`error_by`	True	If non-zero the valve is in error.
`disable_by`	True	If non-zero the component is disabled and data are no longer updated.
`hide_by`	True	If non-zero the component is hidden.

Options	Type	Description
`valueMin`	float	
`valueMax`	float	

Chapter 3

WebBuDi

3.1 Simple Buttons and Displays on the Web

WebBuDi is an acronym for Web Buttons and Displays, is a simple JavaScript file with several declarative blocks that describe data points which the HMI is connected to and assemble a table in which all the data is presented. It provides a textual interaction with selected signals and is suitable for system developers and integrators or may serve as a fall-back mode HMI for non-standard situations.

WebBuDi is composed from several `rows` (a graphical components with pre-defined function and look) connected to a single item in the control system (specified by an `alias` or a `cstring` property). There are different rows according to the type they are changing (for boolean, numbers, dates, etc.). All `rows` are organized in *sections* (colored blocks which can have a heading). The sections are then organizes in several columns.

The configuration is done using JavaScript objects. See 3.1 for more details.

Example

```
1  REX.HMI.init = function(){
2    // Simple PID controller example
3
4    // Optional - Add items first
5    REX.WebBuDi.addItems([
6    {alias: 'PID_MAN', cstring: 'pidcontrol_control.CNB_MAN:YCN', write:
         true}
7    ]);
8
9    // Add WebBuDi section
10   REX.WebBuDi.addSection({
11   column: 1,
12   title: 'User controls',
13   rows: [
14   {alias: 'PID_MAN', desc:'Controller mode', type: 'DW', label_false: '
         AUT', label_true:'MAN'},
15   {type:'ES'},
16   {alias: 'SP_AW', cstring: 'pidcontrol_control.CNR_sp:ycn', desc:'
         Setpoint', type: 'AW'}
17   ]
```

```
18    });
19
20    // Show graph from TRND block
21    REX.HMI.Graph.addSignal({cstring: 'pidcontrol_control.TRND_PIDU',
          labels: ['Process value','Manipulated variable','Setpoint']});
22
23    // Set different target address
24    // REX.HMI.setTargetUrl('ws://192.168.1.100:8008/rex');
25
26    // Set refresh rate (Default: 500 ms)
27    REX.HMI.setRefreshRate(100);
28
29    // Change title of the page
30    REX.HMI.setTitle('Simple PID controller');
31 }
```

.WebBuDi : object

- .addSection(opt) => REX.HMI.WebBuDi
- .add() => REX.HMI.WebBuDi
- .addItems(items) => Array.<REX.WS.Item>

REX.WebBuDi.addSection(opt) => REX.HMI.WebBuDi The `addSection` adds new rows / HMI components to the web page.

The section contains all components defined in `rows` array. It can have `title` shown in header. The whole section can be controlled via `disable_by` and `hide_by` item. Finally the section is placed to the `column` (index based).

The function calls can be chained or called via alias `REX.WebBuDi.add()`.

Kind: static method of WebBuDi

Param	Type	Default	Description
opt			The main configuration object
opt.rows	Array.< RowOption>		Definition of all HMI components / rows. See the list for more details
[opt.title]	String		Title of the section shown in the header.
[opt.column]	number	1	Index of the column (starts from 1).
[opt.background_color]	String		Custom background color of the section.
[opt.text_color]	String		Custom text color of the section header
[opt.disable_by]	String | Object		If defined by 'alias' or object `{alias:"XXX", cstring:"XXX", reverse_meaning:false}` the state of the component changes (enabled / disabled).
[opt.hide_by]	String | Object		If defined by 'alias' or object `{alias:"XXX", cstring:"XXX", reverse_meaning:false}` the visibility of the row changes.

Param	Type	Default	Description
[opt.customDivID]	String	”content”	The ID of the element where all the columns / sections will be appended.

Example

```
// Simple HMI for PIDU_Simple_PID_Controller

REX.WebBuDi.addSection({
  column: 1,
  title: 'Controls',
  rows: [
  // Digital write
  {alias: 'PID_MAN', desc:'Controller mode', type: 'DW', label_false: '
      AUT', label_true: 'MAN'},
  // Analog write
  {alias: 'SP', desc:'Setpoint', cstring: 'pidcontrol_control.CNR_sp:ycn'
      , type: 'AW'},
  {type: 'ES'}, // Empty space
  ],
  hide_by:"",
  disable_by:""
});
```

REX.WebBuDi.add() => REX.HMI.WebBuDi Shortcut for `REX.WebBudi.addSection` function.

Kind: static method of WebBuDi

REX.WebBuDi.addItems(items) => Array.<REX.WS.Item> Add several items at once. This is useful way how to define aliases and use them in various rows

Kind: static method of WebBuDi

Param	Type	Description
items	Array.<Object>	Array of items to register. Shortcut for `REX.HMI.addItems()`.
items.alias	String	
items.cstring	String	
items.write	boolean	Set true if item is writable

Example

```
REX.WebBuDi.addItems([
  {alias: 'PID_MAN', cstring: 'pidcontrol_control.CNB_MAN:YCN', write:
      true},
```

```
3    {alias: 'SP_AW', cstring: 'pidcontrol_control.CNR_sp:ycn', write: true
        },
4    {alias: 'HV', cstring: 'pidcontrol_control.PIDU:hv'}
5  ]);
```

3.2 Available Rows and Components

- AnalogLookupTable ('ALT')
- Analog Write ('AW')
- Analog Read ('AR')
- Digital Read ('DR')
- Digital Write ('DW')
- Empty Space ('ES')
- Link Button ('LINK')
- Manual Pulse ('MP')
- Push Button ('PB')

General row options - Every row is configured with common and row-specific properties. The following object represents the common part.

Properties

Name	Type	Description
type	String	The type of the component / row (eg. "AR")
alias	alias	UNIQUE identification of the item from control system (eg. 'SP'). Must NOT contain spaces or diacritics
desc	String	Name of the component shown in the description (eg. "Set point"). If the `alias` is not defined the `desc` is used instead. The `desc` is converted to lowercase, spaces are substitute with underscore and all non-ascii letters omitted or replaced with ascii equivalent.
cstring	String	Connection string which contain whole path to the target device (eg. "task.CNR:ycn")
disable_by	String | Object	If defined by 'alias' or object `{alias:"XXX", cstring:"XXX", reverse_meaning:false}` the state of the component changes (enabled / disabled).
hide_by	String | Object	If defined by 'alias' or object `{alias:"XXX", cstring:"XXX", reverse_meaning:false}` the visibility of the row changes.
refresh_from	String	If defined by 'alias' or object `{alias:"XXX", cstring:"XXX"}` the value for the item is read from different location than written. It is applicable on for WRITE components

```
1  // All properties
```

```
2 {alias:"SP", desc:"Set point", cstring:"task.CNR:ycn", disable_by:null,
      hide_by:null refresh_from:null}
```

3.2.1 AnalogLookupTable

AnalogLookupTable AnalogLookupTable ('ALT') - Select with list of options. Used for user define enums.

Options	Type	Description
`show_key`	bool	Append keys to the list of options
`values`	table	List of all values which can be selected. It is a Object with key-value pairs (e.g. '{"1":"Options 1", "2":"Options 2"}')

Example

```
1 {type:'ALT', values:{"1":"Options 1", "2":"Options 2"}, show_key: false}
```

3.2.2 AnalogReadRow

AnalogReadRow Analog Read ('AR') - Periodical reading of selected value ('date','time','datetime','text','n 'date', 'datetime' - Show date calculated from seconds from REX Epoch timestamp. 'time' - Show time calculated from seconds. 'text' - Show the value without any transformation (suitable for string values). 'number' - Show number transformed by 'scale', 'offset' and round to number of 'decimals'.

Options	Type	Description
`format`	bool	One of the following 'date','time','datetime','text','number'
`scale`	int	Scale factor
`offset`	int	Offset for the displayed value
`decimals`	int	Number of decimals
`convert`	function	If defined, the 'format='number'' value is transformed using convert function eg. 'convert=function(val){return val+1;}'

Example

```
1 // Show number rounded to 4 decimal places
2 {type:'AR'}
3
4 // Show date
5 {type:'AR', format:'date'}
6
7 // Show string values
```

```
{type:'AR', format:'text'}

// Convert radians to degrees
{type:'AR', format:'number', scale:(Math.PI/180), offset:0, decimals:0}
```

3.2.3 AnalogWriteRow

AnalogWriteRow Analog Write ('AW') - Set ‘date‘,‘time‘,‘datetime‘,‘text‘ or ‘number‘ to the control system. ‘date‘, ‘datetime‘ - R/W date calculated from seconds from REX Epoch timestamp. ‘time‘ - R/W time calculated from seconds. ‘text‘ - Write value without any transformation (suitable for string values). ‘number‘ - R/W number transformed by ‘scale‘, ‘offset‘ and rounded to number of ‘decimals‘.

Options	Type	Description
`format`	bool	One of the following ‘date‘,‘time‘,‘datetime‘,‘text‘,‘number‘
`scale`	int	Scale factor
`offset`	int	Offset for the displayed value
`min`	int	Limit the minimum value
`max`	int	Limit the maximum value
`decimals`	int	Number of decimals
`set_on_blur`	bool	If set the value is written when the input is blured. Use *ESC* to cancel changes
`convert`	function	If defined, the ‘format=’number’‘ value is transformed using convert function eg. ‘convert=function(val){return val+1;}‘
`convertW`	function	If defined, the ‘format=’number’‘ value is transformed before write by convert function eg. ‘convertW=function(val){return val+1;}‘

Example

```
// Change number rounded to 4 decimal places
{type:'AW'}

// Set date
{type:'AW', format:'date'}

// Set string values
{type:'AW', format:'text'}

// Display degrees, read and write as radians
{type:'AW', format:'number', scale:(Math.PI/180), offset:0, decimals:0}

// Default options
{type:'AW', format:'number',
 scale:1, offset:0, min: -Number.MAX_VALUE, max: Number.MAX_VALUE,
```

```
16  set_on_blur:false, convert:null, convertW:null}
```

3.2.4 DigitalReadRow

DigitalReadRow Digital Read ('DR') - Periodical reading of boolean value.

Options	Type	Description
label_false	string	Label for the false / off / disable value.
label_true	string	Label for the true / on / enable value.
label_color_false	string	Color of the label for the false / off / disable value.
label_color_true	string	Color of the label for the true / on / enable value.
reverse_meaning	bool	If set the '0' (zero) means enables / ON and '1' disabled / OFF
color_false	string	Change color of FALSE button when active
color_true	string	Change color of TRUE button when active

Example

```
1 {alias: 'DR', desc:'Controller mode', type: 'DR', label_false: 'AUT',
      label_true: 'MAN'}
2
3 // All options
4 {type: 'DR', label_false: 'OFF(0)', label_true: 'ON(1)', reverse_meaning:
      false, color_false:'', color_true:''}
```

3.2.5 DigitalWriteRow

DigitalWriteRow Digital Write ('DW') - Set boolean value

Options	Type	Description
label_false	string	Label for the false / off / disable value.
label_true	string	Label for the true / on / enable value.
label_color_false	string	Color of the label for the false / off / disable value.
label_color_true	string	Color of the label for the true / on / enable value.
reverse_meaning	bool	If set the '0' (zero) means enables / ON and '1' disabled / OFF
color_false	string	Change color of FALSE button when active
color_true	string	Change color of TRUE button when active
flip	bool	If set the position of the TRUE/FALSE buttons is flipped.

Example

```
1 {alias: 'DW', desc:'Controller mode', type: 'DW', label_false: 'AUT',
      label_true: 'MAN'}
```

```
2
3 // All options
4 {type: 'DW', label_false: 'OFF(0)', label_true: 'ON(1)', reverse_meaning:
      false, color_false:'', color_true:'', flip:false}
```

3.2.6 EmptySpace

EmptySpace Empty Space ('ES') - Creates empty row to fill gaps

Options	Type	Description

Example

```
1 {type: 'ES'}
```

3.2.7 LinkButton

LinkButton Link Button ('LINK') - Create link to different page

Options	Type	Description
`target_url`	string	URL to which the link leads to.
`label`	string	Button label

Example

```
1 {type: 'LINK', target_url:'/hmi/index.html', desc: 'Go to index page ...'
      , label: 'To index'}
```

3.2.8 ManualPulseRow

ManualPulseRow Manual Pulse ('MP') - Manual Pulse controller (for MP block). There are two types of this component. Either 'type:'MP'' which write the TRUE value to the target cstring only once after the button is pressed. On the other hand 'type:'MPRpt'' writes TRUE value periodically every 20 ms when button is pressed. This ca be used to prolong the MP button output.

Options	Type	Description
`color`	bool	Button background color
`label`	int	Buttons label
`labelColor`	int	Button label's color

Example

```
1 {alias: 'MP_RUN', cstring:"task.MP_RUN:BSTATE", type: 'MP'}
2
```

```
{alias: 'MP_RUN', cstring:"task.MP_RUN:BSTATE", type: 'MPRpt'}

{alias: 'MP_RUN', label:'Press me', type: 'MP', color:REX.UTIL.CONSTANTS.
    COLORS.error, labelColor:'#000000'}
```

3.2.9 PushButton

PushButton Push Button ('PB') - One button for setting different values on press and release.

Options	Type	Description
`label_false`	string	Label for the false / off / disable value.
`label_true`	string	Label for the true / on / enable value.
`reverse_meaning`	bool	If set the '0' (zero) means enables / ON and '1' disabled / OFF
`color_false`	string	Change color of FALSE button when active
`color_true`	string	Change color of TRUE button when active
`value_release`	int | string	Set the value which should be set on release (‘reverse_meaning do not apply‘).
`value_press`	int | string	Set he value which should be set on press (‘reverse_meaning do not apply‘).

Example

```
// Write `true` on press and `false` on release
{type: 'PB'}

// Write float value
{type: 'PB', value_release: 0, value_press: 0.1}

// All options
{type: 'PB', label_false: 'OFF(0)', label_true: 'ON(1)', reverse_meaning:
    false,
 color_false:'', color_true:'', value_release: 0, value_press: 1}
```

Chapter 4

REX.HMI library

4.1 How to Use the Library

The user can program the HMI over REX.HMI interface. It contains several public methods for reading and writing items from REXYGEN targets. To create and build your custom HMI based on the RexHMI library, follow these steps:

1. Create project directory with *exec.mdl*. Add the *HMI* block to the executive (see the [2] for more details).
2. Create **.hmi.js* file in *./hmisrc* directory with `REX.HMI.init = function(){}` function inside.
3. Start writing your script.

When the script is ready, enable generation of RexHMI using *GenerateRexHMI* parameter in the *HMI* block of the executive. Then run *Compile and Download* function in the REXYGEN Studio. The content of the **.hmi.js* file is inserted into the RexHMI template with all the necessary scripts and libraries. Users can control which files and directories are copied to *hmi* directory using the the `hmi.json` configuration file. The HMI is then downloaded to the target and available from the internal webserver.

The `REX.HMI` interface is described in the following sections. Each function contains short example with common parameters.

```
1 // Common usage
2 // Append this function to the HTML document or use a predefined
      placeholder in the template
3 REX.HMI.init = function(){
4 // Change some basic settings
5
6 }
```

4.2 Reference Guide for REX.HMI

The main entry point for all RexHMI visualization. This class exposes all methods necessary for reading and writing variables in a control scheme over WebSockets.

Emits: event:time, event:online, event:offline

Properties

Name	Type	Description
REX.HMI.kioskMode	boolean	Set true to enable kioskMode in the HMI

List of all available functions

- .init()
- .connect() =>Promise
- .disconnect()
- .getTarget(url) =>WSTarget
- .setTargetUrl(url, force) =>Promise
- .setRefreshRate(period)
- .addItem(opt) =>Item
- .addItems(items) =>Array.<Item>
- .removeItem(alias) =>Promise
- .get(alias) =>Item
- .$i(alias) =>Item
- .addGroup(g)
- .removeGroup(g)
- .addTrend(t)
- .removeTrend(t)
- .writeValues(aliases, values) =>Promise
- .setTitle(title)
- .setHeaderTitle(title)
- .showHeartBeatClock(show)

- .useClientTime(use)
- .getItemsEventSynchonizer(aliases, events) =>EventSync
- .commit() =>Promise

REX.HMI.init() The user can override this method. The *init* is called when the WebSocket connection is opened, and one can add own items for RW operations. The method can be called either synchronously or asynchronously with callback. Example of the *REX.HMI.init* function is part of the HTML template

Example

```
// Synchronous version
REX.HMI.init = function(){
  REX.HMI.addItem({alias:"SP", cstring:"task.block:param"});
}

// Init with callback
REX.HMI.init = function(done){
  done();
}
```

REX.HMI.connect() =>Promise Connect the RexHMI to the target. This function is called automatically.

REX.HMI.disconnect() Disconnect all items from the target. Stop reading and dispose of connections to all targets.

REX.HMI.getTarget(url) =>WSTarget Return REXYGEN target based on the given URL. If the URL is null (the most common case), it returns the default target.

Param	Type	Description
url	String	URL of the requested target

Example

```
// Retrieve version of the default target
REX.HMI.getTarget().getVersion().then((data)=>{console.log(data)})
```

REX.HMI.setTargetUrl(url, force) =>Promise Sets the new default target URL. When the page is served from the server (not localhost) and the `location.hostname` is set, the *setTargetURL* function sets NULL to use default targetURL. So, the target connects to the location from which the page is served.

This behavior can be changed by setting the `force` parameter to true. Then, the 'url' will be used on any occasion.

Param	Description
url	URL of the target
force	set true if the URL should be set even run from the server with hostname

Example

```
// The most common usage
// If run locally from file:// connect to IP when uploaded to the server (RexCore)
// then connect to `location.hostname`
REX.HMI.setTargetUrl("ws://192.168.0.100:8008");

// Always connect to the localhost
REX.HMI.setTargetUrl("ws://127.0.0.1:8008", true);

// Always use secure WebSocket
REX.HMI.setTargetUrl("wss://192.168.0.100:8008", true);
```

REX.HMI.setRefreshRate(period) Change the default refresh rate (how fast the data from RexCore will be read)

Param	Type	Default	Description
period	number	500	New refresh period [ms]

Example

```
// Change default refresh period to 1000 ms (1s)
REX.HMI.setRefreshRate(1000);
```

REX.HMI.addItem(opt) =>Item Register new *Item* defined by `alias` and `cstring` for periodical reading and asynchronous writing.

Returns: Item - - Registered item

Param	Type	Description
opt	Object	Main configuration object
opt.alias	string	Alias for the connection string
opt.cstring	string	Connection string of the signal from REXYGEN
[opt.url]	string	URL of the target, if NULL the default is used
[opt.period]	number	Item refresh period [ms]
[opt.writeCString]	string	If defined the value of the item will be written to this *cstring*

Example

```
// The most common usage
var sp = REX.HMI.addItem({alias:"SP", cstring:"task.block:param"});
sp.on('change',(data)=>{console.log(data)});

// Different locations of reading and writing (eg. Write before
    saturation and read after)
REX.HMI.addItem({alias: "SP", cstring: "task.SAT:y", writeCString: "task.
    CNR:ycn"});
```

REX.HMI.addItems(items) =>Array.<Item> Add several `Items` at once. See HMI#addItem for more details

Returns: Array.<Item> - - Return array of added items

Param	Type	Description
items	Array. <Object>	An array of items

REX.HMI.removeItem(alias) =>Promise Remove an Item based on its `alias`

Param	Description
alias	Items `alias` used during registration

REX.HMI.get(alias) =>Item Find Item using its `alias`

Param	Description
alias	Items `alias` used during registration

REX.HMI.$i(alias) =>Item Find Item using its `alias`

Param	Description
alias	Items `alias` used during registration

REX.HMI.addGroup(g) Register a custom group of items for R/W operations.

Param	Type	Description
g	REX.WS.Group	Group for registering

Example

```
// Create group see REX.WS.Group
var g = new REX.WS.Group({id:"group1", period:100, url:""});

```

```
// Add some items
g.addItem(new REX.WS.Item({id:"ITEM-1", cstring:"task.block:param", url:"
    "}));

// Register events
g.on('read',(data)=>{console.log(data)});

// Register group
REX.HMI.addGroup(g);
```

REX.HMI.removeGroup(g) Unregister custom group

Param	Type	Description
g	REX.WS.Group	Instance of group which will be unregistered

REX.HMI.addTrend(t) Unlike REX.WS.Group the Trend reads data from TRND* blocks. These blocks store several signals with buffered data. Once registered, the user can process the data from TRND* blocks.

Param	Type	Description
t	REX.WS.Trend	Trend, which will be registered

Example

```
// Create new trend
var trend = new REX.WS.Trend({cstring:"task.TRND", id:"TRND-1", period
    :500, readWholeBuffer:true});

// Register
REX.HMI.addTrend(trend);
// Add event handlers
trend.on('read',(data)=>{console.log(data)});
```

REX.HMI.removeTrend(t) Unregister trend

Param	Type
t	REX.WS.Trend

REX.HMI.writeValues(aliases, values) =>Promise Write one or several values to the control system. Using already registered items (aliases).

Param	Type	Description
aliases	Array.<String>	An array of already registered aliases
values	Array	An array of values to be written

Example

```
// Register some items
REX.HMI.addItems([{alias:"A1",cstring:"task.A1:ycn"},{alias:"A2",cstring:"task.A2:ycn"}]);

// Write values
REX.HMI.writeValues(["A1","A2"],[0.5, 0.7]);
```

REX.HMI.setTitle(title) Change both the title in the header and the title of the webpage

Param	Type	Description
title	String	New title for header and webpage

Example

```
REX.HMI.setTitle("My HMI");
```

REX.HMI.setHeaderTitle(title) Change the header title only.

Param	Type	Description
title	String	New title for the header

REX.HMI.showHeartBeatClock(show) If true, the template will display CLOCK in the upper right corner of the main screen. When the update of the time stops, the default target is disconnected, and the HMI is not updated.

Param	Type	Description
show	Boolean	True to show the clock

REX.HMI.useClientTime(use) Set it to `true` if the time should be displayed in client time, not target time. When the target cannot synchronize with some time server (does not have an RTC chip), it will show the time from the browser.

Param	Type	Description
use	Boolean	True to use client time instead of target one

REX.HMI.commit() => Promise REX.HMI.commit

When called, all the items added after the HMI is connected to the target are initialized at once.

Kind: instance method of HMI

Returns: Promise - - Promise all items are initialized.

REX.HMI.getItemsEventSynchonizer(aliases, events) =>EventSync Return an EventSync object, which emits events when all registered items have emitted the same event.

Param	Type	Description
aliases	Array | String	Array of item aliases or one alias as a string
events	Array | String	Array of events which will be monitored

Example

```
// Register some items
REX.HMI.addItems([{alias:"A1",cstring:"task.A1:ycn"},{alias:"A2",cstring:
    "task.A2:ycn"}]);

var sync = REX.HMI.getItemsEventSynchonizer(["A1","A2"],["read"]);

sync.on("read",()=>{console.log("All read events emitted")});
```

4.3 Reference Guide for REX.HMI.Graph

The time-based graph component, is shown at the bottom of the web page. The graph can read all signals from TRND* blocks. The Graph is shown when the first signal is added over `addSignal` or `addTrend` function.

The REX.HMI.Graph has the following functions:

- .resume()
- .pause()
- .show()
- .hide()
- .addTrend(opt)
- .setSize(size)

- .setRefreshRate(period)
- .hideLegend()

REX.HMI.Graph.resume() Resume redrawing the graph.
Example

```
1 REX.HMI.Graph.resume()
```

REX.HMI.Graph.pause() Pause redrawing the graph.
Example

```
1 REX.HMI.Graph.pause()
```

REX.HMI.Graph.show() Show graph.
Example

```
1 REX.HMI.Graph.show()
```

REX.HMI.Graph.hide() Hide graph.
Example

```
1 REX.HMI.Graph.hide()
```

REX.HMI.Graph.addTrend(opt) Add signals from TRND* blocks to the common graph in HMI.

Param	Type	Description
opt	Object	Main configuration object
opt.cstring	string	Connection string for TRND* block
[opt.labels]	Array.<string>	Array of signal labels
[opt.period]	number	Graph redraw period

Example

```
1 REX.HMI.Graph.addTrend({cstring:"task.TRND", labels:["signal-1","signal-2
    "], period:500});
```

REX.HMI.Graph.setSize(size) Change the size of the graph. The size is in percent of the page.

Param	Type	Default	Description
size	number	0.39	Size of the graph in percents <0;1>

Example

```
1 REX.HMI.Graph.setSize(0.39); // Default
```

REX.HMI.Graph.setRefreshRate(period) Change the refresh rate of all signals and trends.

Param	Description
period	Refresh period [ms]

Example

```
1 REX.HMI.Graph.setRefreshRate(250);
```

REX.HMI.Graph.hideLegend() Hide the legend of the graph.
Example

```
1 REX.HMI.Graph.hideLegend();
```

Chapter 5

WebWatch

5.1 Automatic Generation of HMI from REXYGEN Studio

WebWatch is automatically generated HMI based on the project structure. It is similar to the *Watch mode* in REXYGEN Studio. The whole scheme is generated to web page. User can monitor all signals from selected blocks, change block parameters and read the data from TRND blocks. The WebWatch is generated automatically using *HMI* block in project main file.

Note: The WebWatch visualization is obsolete and will not be activelly mainatained in the future versions of the REXYGEN system. Use the REXYGEN HMI Designer or WebBuDi instead.

1. Insert HMI block to the *exec.mdl* file of your project.
2. Check `GenerateWebWatch` and `IncludeHMI` to enable WebWatch generation.
3. Run *Compile and Download*.
4. Open the web browser and navigate to your target device eg. `http://192.168.1.100:8008/hmi`.
5. Use *left mouse click (touch)* for changing the block parameters and *right mouse click (long touch)* for enabling the block monitoring.

5.2 Advanced Usage

The auto-generated scheme can be adjusted manually. [1]

Edit the `REX.HMI.init = function(){}` function in the selected `*.html` file. There are only few functions for the WebWatch HMI, but you can use all the functions described in chapter 4.

[1] Note: If the *GenerateWebWatch* in HMI block is enabled the HMI is generated whenever the scheme is compiled. So for manual adjustment disable the *GenerateWebWatch* option in *HMI* block.

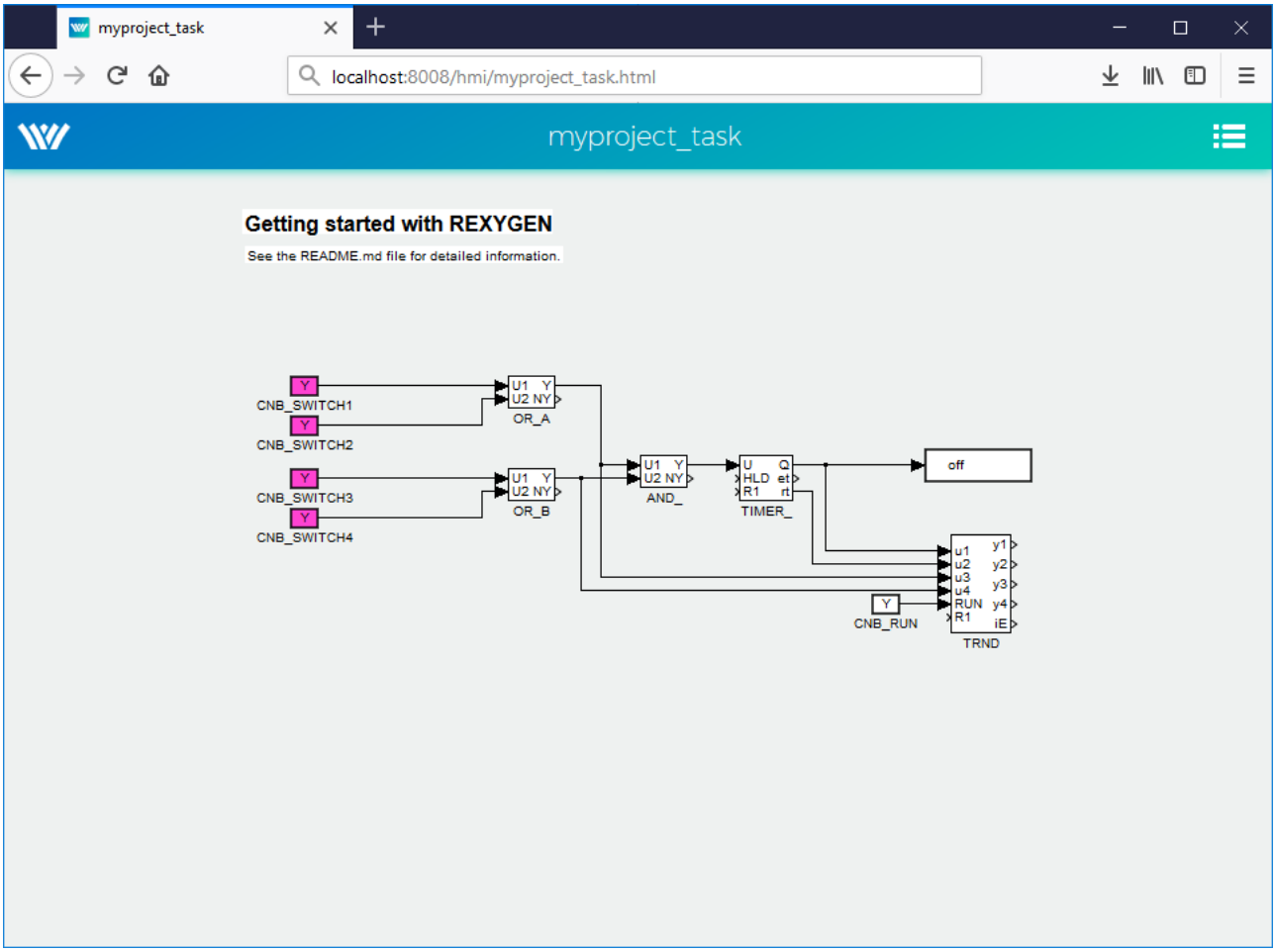


Figure 5.1: The example of WebWatch visualization

REX.WebWatch.enableMonitoring(blockIDs) – Enable monitoring of the selected blocks from the beginning (after web page is loaded).

Param	Type	Description
blockIDs	Array .<String>	List of all blocks, described by connection string (eg.[“task.block1”,“task.block2”])

Example

```
// Enable monitoring of selected blocks
REX.HMI.init = function(){
  REX.WebWatch.enableMonitoring(["pidcontrol_control.CNR_sp","
      pidcontrol_control.PIDU"]);
}
```

REX.WebWatch.disableHint() – Disable hint after page is loaded

REX.WebWatch.showHint() – Show hint

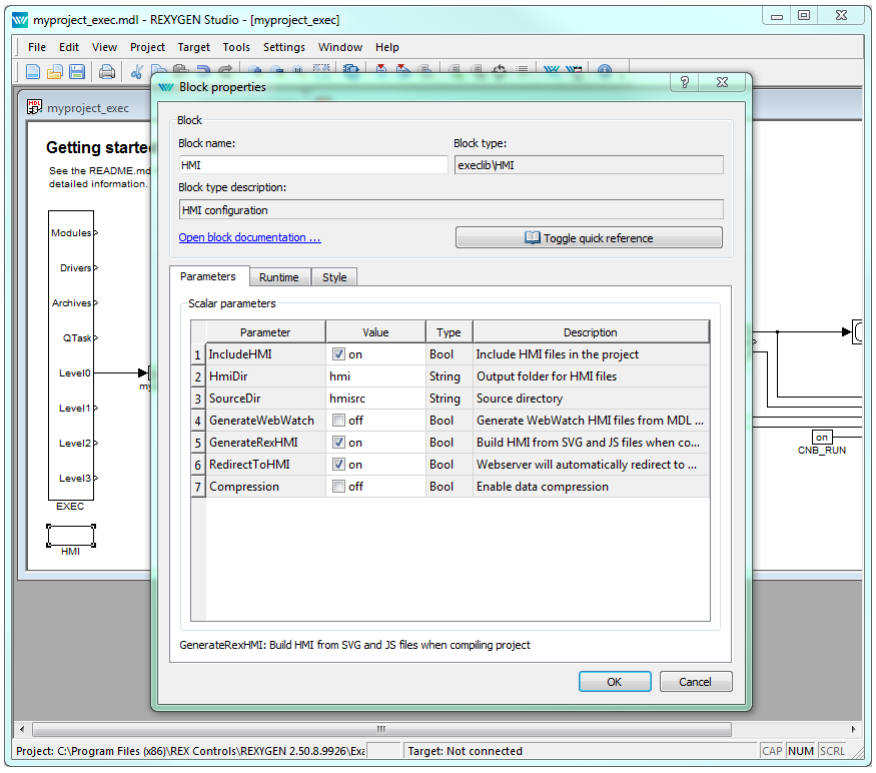


Figure 5.2: Check GenerateWebWatch to create WebWatch HMI.

Bibliography

[1] REX Controls s.r.o.. *Getting started with REXYGEN*, 2024. →.

[2] REX Controls s.r.o.. *Function blocks of REXYGEN – reference manual*, 2024. →.

Documentation reference number: 17331