

User and installation manual



Flow sensor mps flow
 Flow sensor "high flow USB"
 Pressure sensor mps pressure
 D5 pump motor

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1. Preface

The mps product family consists of flow sensors, pressure and fill level sensors and a D5 pump motor. All devices feature a USB and aquabus interface, an external temperature sensor input as well as a programmable alarm signal output.

As this manual covers all members of the mps series, some chapters of this manual will not apply to all product versions.

Considering the fast technical development, we reserve the right to be able to perform alterations to the products at any time. It therefore is possible that your product does not correspond precisely to the descriptions or especially the illustrations in this manual.

2. Safety precautions

The following safety precautions have to be observed at all times:

- Read this manual thoroughly and entirely!
- Save your data onto suitable media before working on your hardware!
- Do not start your computer before you are absolutely sure that no water leaks from the system!
- Pay attention to the care instructions at the end of this manual.
- Make sure that your wall socket is protected by a residual current circuit breaker!

- Use coolants specified in this manual only. Other coolants can damage the system and cause leaking or decreased cooling performance.
- Regularly check the whole system for leaks and replace all seals with signs of wear, every five years at the latest. Suitable spare parts can be purchased from us.
- This product is not designed for use in life support appliances, devices, or systems where malfunction of this product can reasonably be expected to result in personal injury. Aqua Computer GmbH & Co. KG customers using or selling this product for use in such application do so at their own risk and agree to fully indemnify Aqua Computer GmbH & Co. KG for any damages resulting from such application.

3. Scope of delivery

3.1. Flow sensor mps flow 100/200/400 (art. 53130, 53131, 53132)

- One flow sensor
- One diffuser plate (not included in mps flow 100, art. 53130)
- One internal USB cable (replacement part no. 53085)
- One aquabus/speed signal cable (3 contacts, replacement part no. 93111)
- One manual

3.2. Flow sensor "high flow USB" (art. 53129)

- One flow sensor
- One internal USB cable (replacement part no. 53085)
- One aquabus/speed signal cable (3 contacts, replacement part no. 93111)
- One manual

3.3. Pressure sensor mps pressure $\Delta 40/\Delta 100/\Delta 500/1000/\Delta 1000$ (art. 53133, 53134, 53135, 53136, 53160)

- One pressure sensor
- One internal USB cable (replacement part no. 53085)
- One manual

3.4. D5 pump motor with USB and aquabus interface (art. 41093)

- One D5 pump motor
- One internal USB cable (replacement part no. 53085)
- One aquabus/speed signal cable (3 contacts, replacement part no. 93111)
- One manual

4. Flow sensor mps flow 100/200/400

4.1. Technology and specific characteristics

The sensors of the mps flow series are technically based on a differential pressure measurement and do not contain any rotating components. Due to the high sensitivity of the integrated pressure sensors, the sensors pose only a minimal flow resistance. In addition, the sensors are extremely compact.

On the other side, this concept has some limitations regarding compatibility with different types of hoses and fittings. As a general rule, **only straight fittings** should be used to connect a mps flow sensor to the cooling system. Angular fittings alter the flow through the sensor and thereby may falsify flow detection up to the point where the sensor is rendered useless. If used with fittings or hoses with small inner diameters, a diffuser plate included in delivery has to be installed into the coolant inlet thread of the sensor. In these cases, operation without diffuser plate results in highly inaccurate sensor readings! Please see next chapter for details.

4.2. Stainless steel diffuser plate

Depending on inner diameter of the fittings or hoses used with the sensor, the diffuser plate supplied with the sensor has to be installed into the coolant inlet thread of the sensor. The calibration data included in the software can only be used with the exact same combination of fittings, hoses and diffuser plate! The following combinations have been calibrated by Aqua Computer:

| Sensor | Hose system | Diffuser plate |
|--------------|----------------------|----------------|
| mps flow 100 | plug&cool (8/6 mm) | NO |
| | 10/8 mm and 11/8 mm | NO |
| | 13/10 mm (or larger) | NO |
| mps flow 200 | plug&cool (8/6 mm) | YES |
| | 10/8 mm and 11/8 mm | NO |
| | 13/10 mm (or larger) | NO |
| mps flow 400 | plug&cool (8/6 mm) | YES |
| | 10/8 mm and 11/8 mm | YES |
| | 13/10 mm (or larger) | NO |

All calibration data has been determined using fittings supplied by Aqua Computer. Due to different dimensions, actual flow rates may differ from sensor readings when used with fittings supplied by other manufacturers!

4.3. Installation of the diffuser plate

If indicated in the table in the previous chapter, place the stainless steel diffuser plate on top of the coolant inlet thread of the sensor (engraved as “in ►” on the body) and turn it clockwise using a small screwdriver until the plate locks into place on the bottom of the thread bore. The diffuser plate should be centered relative to the drill hole diameter on the bottom of the hole

4.4. Integration into the cooling loop

Install suitable fittings into the threads of the sensor. Gently tighten the fittings by hand and do not use excessive force in order not to damage the threads in the plastic body. Connect both sides of the sensor to your cooling loop and take special care to observe the flow direction indicated on the sensor body!

After installation and initial operation, it may take hours until the sensor is completely deaerated and sensor readings stabilize. If you use a pump with deaeration mode such as the aquastream XT pump, you can activate this mode for some time to speed up the process.

For electrical connections and configuration of the sensor, please refer to chapter 9. and following chapters.

4.5. Approved coolants

Sensors of the mps flow series may solely be used with either Aqua Computer Double Protect Ultra or (automotive) coolant based on water and glycol! In particular, non-transparent/opaque coolants are categorically unsuitable!

5. Flow sensor “high flow USB”

5.1. Technology and specific characteristics

The flow sensor “high flow USB” features an integrated impeller which is driven by coolant flow through the sensor. Movement of the impeller is electronically detected and converted into a flow value.

5.2. Integration into the cooling loop

Install suitable fittings into the threads of the sensor. Gently tighten the fittings by hand and do not use excessive force in order not to damage the threads in the plastic body. Connect both sides of the sensor to your cooling loop, flow direction is not relevant for this sensor.

For electrical connections and configuration of the sensor, please refer to chapter 9. and following chapters.

6. Pressure sensor mps pressure $\Delta 40/\Delta 100/\Delta 500/1000/\Delta 1000$

6.1. Technology and specific characteristics

Pressure sensors of the mps pressure series can be utilized in a variety of situations: The sensors can be used as **fill level sensors** for virtually any type and size of reservoir. In this configuration, the sensor detects the pressure generated by the water column inside the reservoir.

Another field of application is **differential pressure measurement across filter elements** to monitor residues and clogging as a much more precise maintenance indicator than optical inspection. Accordingly, residues and clogging in micro structure coolers can be monitored.

A differential pressure measurement between inlet and outlet of a **pump** can be used for operation monitoring and provide valuable information for hardware testers.

6.2. Installation of fittings

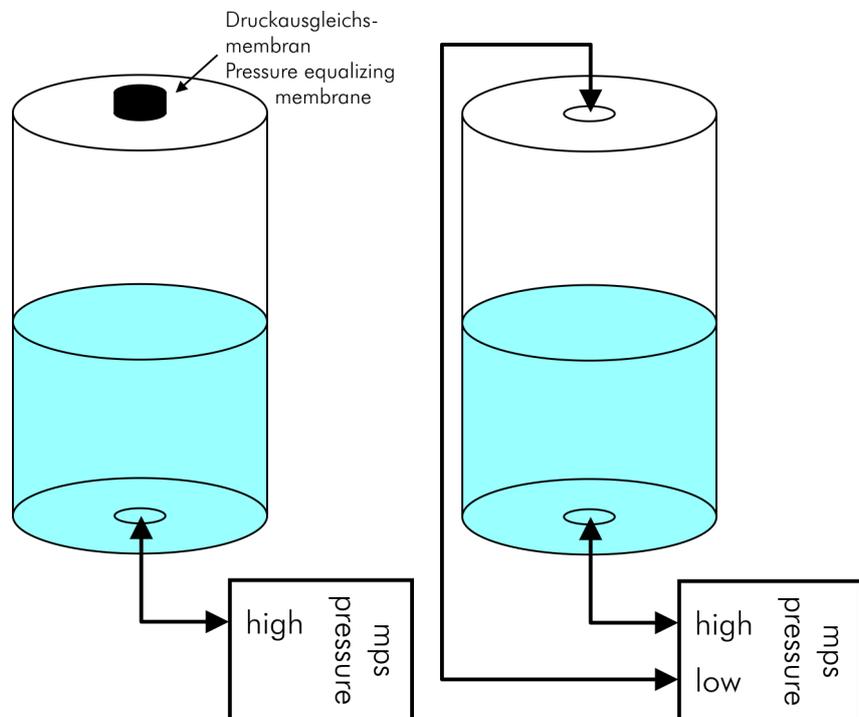
Install suitable fittings into the threads of the sensor. Gently tighten the fittings by hand and do not use excessive force in order not to damage the threads in the plastic body.

6.3. Installation as a fill level sensor

Install the sensor on the same height or lower than the bottom inlets of the reservoir and connect one of the bottom inlet to the port "high" of the sensor. For accurate sensor readings, keep tubing length to a minimum.

Additionally, either the port "low" of the sensor (types $\Delta 40/\Delta 100/\Delta 500/\Delta 1000$ only) has to be connected to a top port of the reservoir or a pressure equalization membrane has to be installed into a top port of the reservoir (valid for all sensor types).

If the port "low" is used, the hose connecting this port to the top of the reservoir has to be filled with air. Otherwise, the sensor will produce erratic readings and the actual fill level may differ significantly from sensor reading! Aqua Computer therefore



strongly recommends using a pressure equalization membrane! Fittings and pressure equalization membrane are not included in delivery and have to be bought separately!

For electrical connections and configuration of the sensor, please refer to chapter 9. and following chapters.

6.4. Installation as a differential pressure sensor

Connect both sensor ports to the coolant lines directly prior and behind the component you want to monitor (for example using suitable T connectors). Connect the port "high" to the spot where you expect the higher relative pressure. You can use the following table as reference:

| Component | connect "high" to | connect "low" to |
|-------------|-------------------|------------------|
| Filter | Inlet port | Outlet port |
| Water block | Inlet port | Outlet port |
| Pump | Outlet port | Inlet port |

For electrical connections and configuration of the sensor, please refer to chapter 9 and following chapters.

6.5. Approved coolants

Sensors of the mps pressure series may solely be used with either Aqua Computer Double Protect Ultra or (automotive) coolant based on water and glycol! In particular, non-transparent/opaque coolants are categorically unsuitable!

7. Fill level sensors in aqualis and aquainlet series reservoirs

7.1. Technology and specific characteristics

The fill level sensors in reservoirs and compatible pump modules of the aqualis and aquainlet series detect the pressure generated by the water column inside the reservoir. For reliable operation, the reservoir must be installed in an upright orientation and the pressure equalization membrane included in delivery has to be installed into a top port of the reservoir (pre-installed during production).

For electrical connections and configuration of the sensor, please refer to chapter 9. and following chapters.

7.2. Approved coolants

All fill level sensors may solely be used with either Aqua Computer Double Protect Ultra or (automotive) coolant based on water and glycol! In particular, non-transparent/opaque coolants are categorically unsuitable!

8. D5 pump motor with USB and aquabus interface

8.1. Description

The D5 pump motor is a efficient pump motor and has to be combined with a suitable body to form a pump. The electronically commutated motor with a spherical ceramic bearing features smooth rotation and high mechanical endurance. The pump is equipped with overheat protection that will first reduce the pump speed if the temperature rises to a critical level. If the temperature still rises further, the pump will be shut down completely. After cooling down, the pump will resume operation automatically.

8.2. Installation to Aqua Computer products

Suitable products manufactured by Aqua Computer for the D5 pump motor include a gasket as well as a mounting ring with compatible screws. If the manual supplied with that product does not state otherwise, install the pump motor as follows:

1. Place the gasket into the pump receptacle. When properly inserted, the gasket is properly aligned to the pump receptacle on the outer diameter.
2. Insert the D5 pump motor into the pump receptacle.
3. Slide the mounting ring into the rear side of the pump motor (where the electrical connections are) and take care not to jam any cables. Secure the ring with the appropriate counter-sunk M4 screws. Gently tighten the screws by hand and do not use excessive force in order not to damage the threads!

8.3. Allowed mounting orientations:

During operation, the pump's rotor must be positioned to the top or to the side in relation to the control knob. The rotor must not face down during operation!

8.4. Power connection and initial operation

Prior to operation, the cooling system has to be filled with suitable coolant. As a centrifugal pump, the D5 pump motor is not self-priming, so the pump will not work unless the pump chamber is filled with coolant. Therefore, installing the pump in close proximity to a reservoir using a short hose connection with a preferably big inner diameter to connect the suction side of the pump to the reservoir is recommended.

The electronic components of the pump must not get in contact with coolant or water! Immersed operation is not allowed!

Shut down your PC and connect the power connector of the pump to a compatible connector of the PC's power supply unit. Do not use excessive force but double check the polarity of the plug if you are having trouble to connect the cable. For further electrical connections and configuration of the pump, please refer to chapter 9. and following chapters.

8.5. Approved coolants

The D5 pump motor may solely be used with either Aqua Computer Double Protect Ultra or a (automotive) coolant based on water and glycol! In particular, non-transparent/opaque coolants are categorically unsuitable!

9. Electrical connectors

ATTENTION: Completely turn off your power supply or disconnect the mains power cord from the wall outlet before connecting or disconnecting any cables to/from the device!

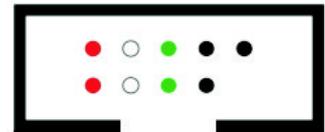
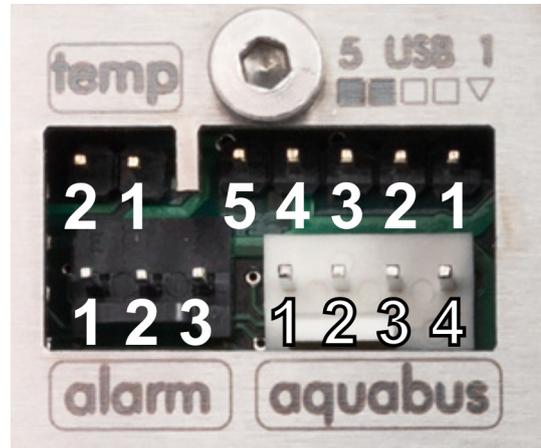
9.1. Connector “USB”

This connector is used for USB communication to the PC and for power supply. Connect to an internal USB header of your motherboard. Take special care to make sure the pin alignment matches your motherboard!

The corresponding connector on the motherboard is usually a 9 pin connector with two independent USB ports. Both rows of 4/5 pins can be used to connect an USB device. The black wires (GND) are to be connected to the side of the missing pin, see picture with colored pin assignment.

Pin assignment:

- Pin 1: +5 V (red)
- Pin 2: D- (white)
- Pin 3: D+ (green)
- Pin 4: GND (black)
- Pin 5: GND



9.2. Connector “aquabus”

Connectors for communication with other devices from Aqua Computer. If connected to an aquaero 5/6 controller by a 4 pin aquabus cable (53122), the USB connection to the PC may be disconnected after initial configuration. In this case, power will be supplied through the aquabus connection from the aquaero 5/6.

Compatible aquabus devices:

- aquaero 6 XT (53146, 53206, 53250, 53251, 53262, 53263)
- aquaero 6 PRO (53145, 53253)
- aquaero 6 LT (53234)
- aquaero 5 XT (53089, 53125, 53249)
- aquaero 5 PRO (53090, 53252)
- aquaero 5 LT (53095)

Pin assignment: Pin 1: GND
 Pin 2: SDA
 Pin 3: SCL
 Pin 4: +5 V

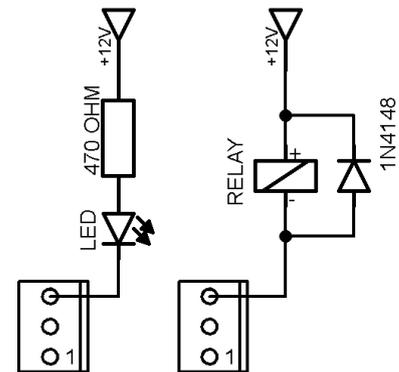
9.3. Connector "alarm"

Depending on configuration, this header can either be used as a generic speed signal or as a "open collector" switching signal.

The speed signal or the switching signal can be configured to be deactivated or activated in case of an alarm condition for monitoring purposes. For example, a speed signal cable (93111) can be used to connect this header to the CPU fan header of your motherboard. Depending on the type of motherboard and BIOS settings, emergency shutdown of the PC upon alarm condition or an acoustic alarm may be initiated. Please refer to the motherboard manual for details on functionality and BIOS settings.

Alternatively, if configured as "power switch (53217)", this connector can be connected to the power switch header of the motherboard using an additional specialized cable (art. 53217, not included in delivery).

Pin assignment: Pin 1: GND
 Pin 2: not connected
 Pin 3: RPM/open collector max. 30 V / 100 mA



9.4. Connector "temp"

Connector for a temperature sensor.

Compatible sensors:

- Temperature sensor inline G1/4 (53066)
- Temperature sensor inner/outer thread G1/4 (53067)
- Temperature sensor G1/4 (53147)
- Temperature sensor plug&cool (53025)
- Temperature sensor 70 cm (53026)

10. aquasuite software

The Windows software aquasuite is an extensive software suite and can be used for configuration and monitoring. The software is not required for operation though. All configuration parameters can be saved into the device's memory.

Please note: Depending on the type of product you are using, some features may not be available for your device.

10.1. Installation of the aquasuite software

For configuration and monitoring of our products with USB interface, the aquasuite software is available for download from our website www.aqua-computer.de. You will find the setup program in the support section of the website under Downloads/Software.

The setup program checks all connected USB devices for embedded update service periods and offers various aquasuite versions depending on detected devices. If no device with update service for the latest aquasuite version is found, a warning is displayed and older aquasuite versions that do not require an update service purchase can be selected for installation. For installation and update service validation, an internet connection is required.

The latest aquasuite version may also be installed if no suitable update service period has been found in a device. Subsequently, update service may be purchased or an existing key may be entered within the aquasuite. These functions can be accessed in the aquasuite/Updates tab.

10.2. Basic operation

The program window is divided into two main areas. On the left side, a list of “overview pages”, data quick view, data logger, device pages, aquasuite web and aquasuite configuration is displayed, the right side shows the details of the currently selected list element. The list can be hidden or restored by clicking the arrow symbol in the upper left corner.

List elements may be minimized or maximized for easier access by clicking the title bar. The title bars may contain various symbols that will be explained in the following chapter.

10.3. Symbols in the headlines



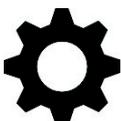
Click the plus symbol in the “Overview pages” headline to create a new overview page.



Clicking the monitor symbol will toggle desktop mode for this overview page. While desktop mode is active, the color of the symbol will change to orange.



Overview page: Clicking the padlock symbol will unlock or lock this overview page for editing. Device: Device can not be used due to update service problems, see “Updates and update service” for details.



Clicking the gear symbol will access the basic configuration page of the selected list element.



In order to save all settings into a device, click the disk symbol in the headline.



This symbol indicates that communication with this device is not possible at the moment. Check USB connection and power supply of the device if necessary.

11. Overview pages (aquasuite)

Current sensor readings and diagrams from all supported devices can be displayed in overview pages. For each device a pre-configured overview page is automatically generated the first time the device is connected to the PC. These pages can be individually modified and new pages can be created. Within one overview page, data from all connected devices can be accessed.

11.1. Desktop mode

Each overview page can be displayed directly on your desktop. You can enable desktop mode for an overview page by clicking the monitor symbol in the list of overview pages. Desktop mode can only be enabled for one overview page at a time. With desktop mode enabled, elements of the overview page may cover program symbols on your desktop, but mouse clicks are transmitted to underlying desktop symbols.

If a overview page is unlocked for editing while desktop mode is active, the page will be displayed in the aquasuite window for editing and the current desktop will be displayed as background for your convenience.

11.2. Creating new overview pages and activating edit mode

In order to create a new overview page, click the plus symbol in the headline "Overview pages".

Existing overview pages can be unlocked for editing by clicking lock symbol in the page listing.

11.3. Adding new elements

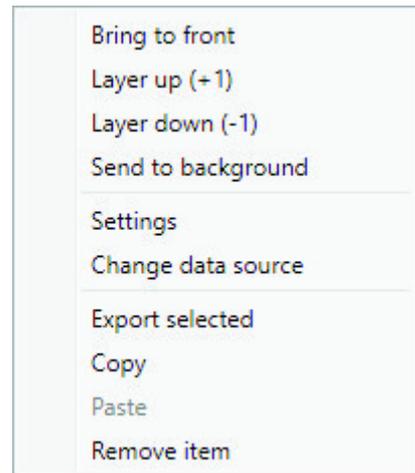
If the currently selected overview page is unlocked for editing, a plus symbol is displayed in the top right corner of the screen. Click the symbol to add a new element to the page and select the desired element from the following list. All available data is displayed in a tree diagram, click the arrow symbols to access individual items.

Confirm your selection by clicking the check symbol in the bottom right corner. The new element will be displayed in the upper left corner and the configuration window is displayed. Configure the element as described in the next chapters.

11.4. Editing existing elements

If the currently selected overview page is unlocked for editing, right-clicking an element will access a context menu.

To access the settings of an element, select “Settings” in the context menu or simply double click the element. If you want to move an element, “drag” this element while holding down the mouse button. Release the mouse button when the element is at the desired position.



11.5. Values and names

If the currently selected overview page is unlocked for editing, right-click an element and select “Settings”. You may also double click the element.

Font face, size and color as well as position, decimal places and unit can be configured for individual values.

11.6. Detailed data elements

If the currently selected overview page is unlocked for editing, right-click an element and select “Settings”. You may also double click the element. Apart from position, size and color, the style of the element can be selected and configured. The following styles are available:

- **Headline only:** Compact display as a headline.
- **Text:** Displays the numerical value in a box with a headline.
- **Bar graph:** Displays numerical value as well as bar graph.
- **Chart:** Displays the value in chronological sequence as a chart.
- **Gauge:** Displays the value as an analog gauge.

All display styles offer extensive configuration options, additionally statistical data such as minimum, maximum and average can be displayed.

11.7. Log data chart

This element can be used to display charts on overview pages. The charts have to be created using the data log functionality of the aquasuite before they become available for overview pages. Please refer to the next chapter for details. Once a chart has been configured, it can be selected from the “Chart selection” list on the “Display” tab of the settings dialog.

11.8. User defined: Images, text, drawing elements

By using user defined controls, simple drawing elements such as circles, rectangles and texts as well as images and more sophisticated elements can be added to an overview page. To do so, add an “User defined” element to an overview page. Switch to the “Display” tab in following dialog box, select the type of element to be

created from the drop down menu and confirm your selection by clicking the “Load preset” button. Depending on the type of element, an additional dialog may appear before the code (XAML, Extensible Application Markup Language) of the new element is displayed in the lower part of the dialog window. You may want to customize the code. By clicking the “Ok” Button, the new control is saved to the overview page.

Step-by-step example to add an image: Select “Image” from the drop down menu and click the “Load preset” button. Select an image file using the following file selection dialog. The code is then displayed in the lower part of the dialog window and can be modified. Save the new control by clicking the “Ok” button. The picture will be displayed on the overview page.

More complex controls such as data bindings and animations are also available but will require some programming experience for configuration.

11.9. Export and import of overview pages

Elements and complete overview pages can be exported from the aquasuite and can then be imported either on the same PC or on other PCs. For export as well as import, the overview page must be in edit mode.

To export a complete page, right click a free spot of the page and select “Export page” from the context menu. To export individual elements, select the element or elements, perform a right click and select “Export selected” from the context menu. For import, right click a free spot of the page and select “Import page” or “Import items” from the context menu. Using “Import page”, the current page will be deleted and only the imported page items will be displayed, using “Import items” will add the items from file to the current page without altering the existing items. During import, the elements will be assigned to devices using the following scheme:

If a device with identical serial number is found on the computer, no changes are made.

If no device with identical serial number is found on the computer, the element will be assigned to the first device found of identical type.

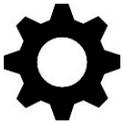
When importing complex pages with elements referring to more than one device, it is recommended to edit the device assignment in the file using a text editor prior to importing.

12. Data quick view and data log (aquasuite)

All data currently monitored by the aquasuite can be accessed in the “Data quick view” section. This includes data from connected USB devices as well as hardware data supplied by the Aqua Computer background service. Displayed data may be filtered using the text box next to the magnifier icon, a chart shows the development over a maximum of ten minutes. All data shown here is not stored permanently.

In contrast, the “Data log” may be used to selectively and permanently store data from all connected Aqua Computer devices and hardware data supplied by the background service. Logged data can then be analyzed by creating charts or be exported to files. Data is only logged while the aquasuite software is being executed.

12.1. Log settings



The log settings can be accessed by clicking the “Log settings” element below the “Data log” headline in the listing. To log data, create a new log data set by clicking the plus symbol in the upper right corner of the settings window. Enter name, time interval and configure automatic deletion of old data to meet your requirements. You may then add the data sources to log by clicking the plus symbol in the “Data sources” window section. You may add an unlimited number of data sources to each log data set, the total number of log data sets is also unlimited.

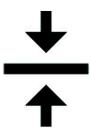
12.2. Analyze data



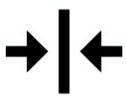
Logged data can be visually evaluated as charts. To do so, select “Analyze data” below the “Data log” headline in the listing. The chart will initially be empty, directly below the chart are eight buttons to modify the chart. In the lower section of the window, the chart data can be configured. To add data to the chart, first select the “Data sources” tab in the chart configuration and select a data set to be displayed. If no data sources are available, you will have to configure the log settings as described in the chapter “Log settings” of this manual. Select the time period to be displayed on the right side of the window and add the data to the chart by clicking the “Add data to chart” button. Repeat this procedure if you want to display more than one data set in the chart. You may modify the chart using the “Chart setup” and “Data series setup” tabs. Finally, you can use the “Chart manager” tab to save the current chart configuration and to load or delete previously saved configurations. All saved chart configurations will be available on overview pages for the “Log data chart” element. The currently displayed chart can be edited by using the buttons directly below the chart and may also be saved as an image file. The button corresponding to the currently selected function is highlighted by an orange frame. Please refer to the following list for details on each function:



To save the currently displayed chart as an image file, click the floppy disk symbol and select a name and location in the following dialog.



This function can be used to add horizontal lines to the chart. While this function is activated, simply click into the chart to add a line at the current cursor position.



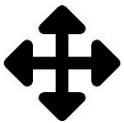
This function can be used to add vertical lines to the chart. While this function is activated, simply click into the chart to add a line at the current cursor position.



This function can be used to add annotations to the chart. While this function is activated, simply click into the chart to add an annotation at the current cursor position. By clicking into the text box, you may edit the text. You may also drag the little circle beside the text box to move the connecting line to the desired position. Use drag and drop to move existing annotations.



This function can be used to remove horizontal/vertical lines or annotations from the chart. While this function is activated, simply click the element to be removed.



This function can be used to move the visible portion of the chart. Press and hold the mouse button while moving the cursor in the chart to select the position to be displayed, then release the button.



This function can be used to zoom in and out. Use the mouse wheel or select the area to be displayed. You can reset the zoom settings by double-clicking in the chart area.



This function can be used to reload and update the chart.



This function will completely remove the chart.

12.3. Manual data export

Saved data can be exported from the data log into a XML file. To do so, select "Analyze data" below the "Data log" headline in the listing. Select the "Data sources" tab in the chart configuration and select a data set to be exported. If no data sources are available, you will have to configure the log settings as described in the chapter "Log settings" of this manual. Select the time period to be exported on the right side of the window and start the export process by clicking the "Export data" button. Enter a file name and path in the following dialog window.

12.4. Automatic data export



The automatic data export feature can be used to save data from the aquasuite into an XML file on the hard disk or in the RAM ("memory mapped file") in a regular time interval. The automatic data export will always overwrite the previously saved data, so the file always contains only the most recent data set. Select "Automatic data export" below the "Data log" headline in the listing to access the settings screen. Create a new export data set by clicking the plus symbol in the upper right corner of the screen. Enter name, path and time interval to meet your requirements. You may then add the data sources to log by clicking the plus symbol in the "Data sources" window section. You may add an

unlimited number of data sources to each export data set, the total number of export data sets is also unlimited.

13. Configuration of the mps device (aquasuite)



Select "Configuration" from the device list below the "mps" entry.

13.1. Sensor configuration flow sensor mps flow

The flow sensors of the mps flow 100/200/400 series are based upon a differential pressure measurement around a nozzle element that is greatly affected by installed fittings and hoses.

Click the "Import calibration data" button, select the appropriate entry for your hose system and confirm your selection by clicking "Load".

For accurate flow measurement, the zero flow value must be calibrated regularly, therefore "Automatic calibration of zero flow" is activated by default. If activated, the sensor will perform a calibration of the zero flow value when the pump is not running, for example if the PC is in standby and the sensor is still powered by USB connection. If you decide not to use automatic calibration, you will have to manually perform a calibration on a regular basis by clicking "Set current flow to zero" when the pump is not running.

If you are using fittings or hoses from other manufacturers, you may or have to calibrate the flow sensor manually. To do so, you will have to determine at least two different flow rates by using a reference sensor or manual gauging and note the corresponding "unscaled values" of the mps sensor (displayed in the lower left area below the calibration curve). For best results, use a flow rate in the middle of the range as well as a flow rate in the upper range of the sensor. Add your values in the "User defined flow calibration" section and click the button "Calculate calibration data". The software will calculate the calibration curve which can also be manually customized.

13.2. Sensor configuration fill level sensor



Before the sensor can produce accurate readings, it needs to be calibrated. To do so, use a folding rule or measuring tape to determine current fill level and maximum fill level of your reservoir and enter the values into the corresponding boxes of the software. After confirming these values by clicking "Calibrate", the software will generate the calibration data.

The calibration curve can be manually adjusted, although it should not be necessary.

13.3. Sensor configuration pressure sensor

Before the sensor can produce accurate readings, the zero value has to be calibrated. To do so, make sure that the sensor is at zero (differential) pressure. If the sensor is connected to monitor a differential pressure around a component in the cooling loop, the pump must be turned off during the calibration process. Then start the calibration process by clicking “Calibrate zero value” and wait until the process is finished. If you have turned off you pump before, make sure to start it again.

The calibration curve can be manually adjusted, although it should not be necessary.

13.4. Pump power

Adjust pump power as desired. Please note that flow rate and pump speed do **not** scale proportionally to selected pump power!

14. Alarm configuration of mps device (aquasuite)



Select “Alarms” from the device list below the “mps” entry.

14.1. Speed signal/Output

The alarm header can be configured as a speed signal output or as a switching output.

Option “Power switch (53217)”: This mode can be used for emergency shutdown of the PC, if the “alarm” header is connected to the power switch header of the motherboard using a suitable cable (art. 53217). Before connecting the cable, make sure the mps device is configured correctly! After connecting the cable, test the setup by deliberately creating an alarm condition. If the PC is not shut down, the cable header connected to the motherboard must be rotated by 180 degrees and the test has to be repeated. Emergency shutdown may result in data loss as operating system and running programs are not shut down properly!

14.2. Alarm timeout

Alarm detection will be delayed by the time interval specified here. This feature will prevent short-time deviations beyond alarm limits from raising an alarm, for example to prevent flow alarms when using the automatic speed feature or deaeration feature of an aquastream XT pump.

14.3. Alarm reporting and alarm limits

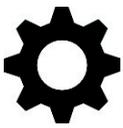
Select the data sources to be monitored and set appropriate alarm limits. If the current reading is below the lower limit or higher than the upper limit, an alarm will be raised if the check box “Activate alarm” is set for this value. All sources that currently raise an alarm are highlighted with a red background color in the software.

Make sure only to use readings for alarm evaluation that are functional with your specific device. Depending on the device type, various data sources are available for alarm reporting.

15. System settings for mps device (aquasuite)

Select “System” from the device list below the “mps” entry.

15.1. Device information



The details displayed here might be required when you contact our service for support. You may enter a “Device description” for easier identification, this text will be displayed in the device list and in the data quick view.

15.2. Factory defaults

Click the button “Reset device to factory defaults” for a complete reset of all settings. You will have to completely reconfigure the device after resetting it to factory defaults!

15.3. aquabus configuration

Before connecting devices of the mps family to an aquaero 5/6 controller, each mps device has to be configured to an individual aquabus address. You may skip this step if only one mps device is connected to an aquaero 5/6. Addresses 12, 13, 14 and 15 are available for mps devices.

Beginning with firmware version 1011 included in aquasuite version 2017-3, data received over aquabus from an aquaero 5/6 is always prioritized. Manual configuration of data prioritization is no longer necessary.

15.4. Device type

Select the appropriate device type from the drop down list. This setting will determine how sensor readings are processed internally and which settings will be available. **If not set correctly, proper operation will not be possible!** The following table shows the correct assignment of article numbers and device type selection:

| Article number | Device type |
|-----------------------------|--------------------------------|
| 34041, 34042, 34050, 34058, | aqualis/aquainlet (fill level) |

| | |
|---|--------------------------------|
| 34059, 34060, 34061, 34066, 34067, 34068, 34069, 34072 | |
| 41093 | Aqua Computer D5 |
| 41095, 41097, 41099, 41101 | aqualis/aquainlet (fill level) |
| 53129 | high flow USB |
| 53130 | mps flow 100 |
| 53131 | mps flow 200 |
| 53132 | mps flow 400 |
| 53133 | mps pressure 40 |
| 53134 | mps pressure 100 |
| 53135 | mps pressure 500 |
| 53136, 53160 | mps pressure 1000 |

15.5. Firmware update

The aquasuite software contains the current firmware files for all supported Aqua Computer devices. The button “Update firmware to version xxxx” will only be displayed if the current firmware of the device is not up to date. In this case, click the button to perform a firmware update. During the update process, do not disconnect the device from the PC and do not power down the PC! After the firmware is successfully updated, the aquasuite software will be automatically closed. Upon next start-up, the device has to be configured anew.

16. Playground (aquasuite)

Click the entry “Playground” to configure Virtual Software Sensors, global profile management and hotkeys.

16.1. Input values



Input values defined in this section can be manipulated by individually configured control elements, for example sliders or buttons.

Create a new input value by clicking the plus symbol in the upper right corner of the “Input values” window and configure the properties as desired. A name, an icon, a unit, a range of values as well as a initial value can be assigned to each input value. This new input value will then be available to be displayed on overview pages and in the quick view section and can be used as a data source for software sensors and virtual software sensors.

In the lower area of the window, control elements can be created and configured to manipulate the input value. These preconfigured control elements can then be used for overview pages or in the system tray.

16.2. Virtual Software Sensors

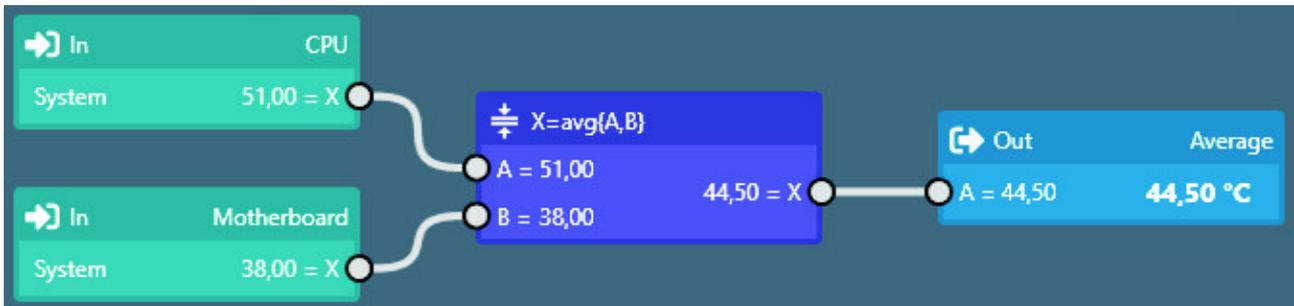


Virtual Software Sensors can be used for extensive yet easy to use adaptation and calculation of sensor values using mathematical and logical functions as well as filters.

Create a new Virtual Software Sensor by clicking the plus symbol in the upper right corner of the “Virtual Software Sensors” window. Each Virtual Software Sensor always has an “Out” element which will provide the resulting sensor value. In the settings dialog of this element, the name and unit of the sensor can be configured. You can now add data sources and function blocks to the lower area of the sensor window and connect inputs and outputs of the blocks with lines. Connect the output of the last function block with the “Out” element.

The resulting virtual sensor can be used within the aquasuite software, for example for overview pages, additionally it may be transmitted via USB connection to connected devices that feature software sensors.

The following (very simple) example calculates the average out of two temperatures:



Virtual software sensors are updated once per second and re-calculated with the numbers valid in that particular moment. When using fast changing input values, extreme values can therefore either be used or ignored for the calculation. No smoothing or averaging is taking place.

16.3. Output actions



While the virtual software sensors are used as a value within the aquasuite, output actions configured in this section are used to trigger events. Various notification events including emails and MQTT messages are available. Additionally, external programs can be started.

Create a new output action by clicking the plus symbol in the upper right corner of the “Output actions” window and configure the properties as desired. Each output action always has an “Output” element which represents the event itself. In the settings dialog of this element, the event to be executed can be selected and configured.

You can now add data sources and function blocks to the lower area of the window and connect inputs and outputs of the blocks with lines. Connect the output of the last function block with the “Output” element. The event will be executed when the input of the “Output” element reaches a value greater than zero.

Output actions are updated once per second and re-calculated with the numbers valid in that particular moment. When using fast changing input values, extreme values can therefore either be used or ignored for the calculation. No smoothing or averaging is taking place. Example: If thresholds are exceeded for very short periods of time lasting less than one second, the action can be executed or not be executed seemingly at random, depending on whether the thresholds is exceeded in the exact moment the calculation is performed.

16.4. Global profiles



The global profile management can be used to conveniently change settings in multiple devices simultaneously and activate desktop pages. Individual actions can be defined for each of the four profiles, switching between profiles can either be done manually or automatically depending on configurable rules.

In order to use this feature, set up profiles within the individual device configurations first. These profiles can then be activated using the global profile management. Not every type of device supports profiles.

Buttons in the upper window area can be used to switch between global profiles. Alternatively, the profile icon in the title bar of the aquasuite window or a profile icon in the system tray may be used.

Example use cases: Switching of LED illumination settings depending on current time of day or modification of fan settings when a graphics application is launched.

Notice for profile activation depending on running applications: During configuration of the respective rule in the aquasuite, the application to be configured must already be running. The application selection within the aquasuite will always show currently running applications and processes only.

16.5. Hotkeys



Hotkeys are key combinations that will be processed system-wide and can activate global profiles or desktop pages. The configured key combinations will be registered in the operating system and be processed by the background service. If the configured actions only use the profile management, the aquasuite does not have to be running for hotkeys to be operational; if desktop pages are used, the aquasuite must be running.

Do not use key combinations for this function that are required by other applications.

17. aquasuite web

Click the entry “aquasuite web” to publish data on the internet or import data from the internet. The server for this service is operated by Aqua Computer and provided for use with the aquasuite, without warranty for error free operation or permanent availability. Aqua Computer reserves the right to limit or cancel this service at any time.

17.1. Data export



To publish data, create a new export data set by clicking the plus symbol in the upper right corner of the “Data export” window. The name of the data set may be modified to meet your requirements. You may then add the data sources to export by clicking the plus symbol in the “Data sources” window section. By clicking the gear symbol, the name of the corresponding value can be changed. Up to 30 data sources can be added to each export data set, the total number of export data sets is limited to 10. All selected values will be transmitted to the Aqua Computer server by the Aqua Computer background service approximately every 15 seconds, even after closing the aquasuite.

Notice regarding data security: All data contained in the configured export data sets is transmitted to the Aqua Computer server with transport security. The server stores the data set in volatile memory until a new data set is received or until 10 minutes have passed. Data received is not permanently stored, data is also not correlated to IP addresses or other personal data. Data on the server may be accessed by anyone without restrictions, furthermore automatic data collection and recording through third parties is possible. Use the data export feature for data that you want to publish publicly and are allowed to do so only.

17.2. Data access



Published data can be obtained from the Aqua Computer server in various formats. Generally, the “access key” is required to access data.

In addition to access through any internet browser and importing data into the aquasuite, data is also available in JSON format and compatible to Circonus. Furthermore, the server generates banner images in two different sizes from the transmitted data, suitable to be included in forums signatures. The code required for the Aqua Computer forums is provided for your convenience.

17.3. Data import



To import a data set from the Aqua Computer server, the “access key” of the data set is required. The access key can be found in the aquasuite on the computer providing the data in the “Data access” section.

Create a new import entry by clicking the plus symbol in the upper right corner of the “Data import” window. Enter the access key of the data set to be imported. Up to 10 data sets (each containing up to 30 values) can be configured.

In order to verify that data is being imported, use the “Data quick view” feature in the aquasuite. Navigate to “Data from Aqua Computer service”, then “aquasuite web”. For each imported data set, you should find an entry with the name of the data set containing the individual values. It may take a few seconds before imported data is displayed.

18. Basic settings (aquasuite)



Click the entry “Settings” below the headline “aquasuite” to access basic settings for language, units and start-up of the software.

18.1. Language

Select a language from the drop down menu. After changing the language setting, the software will have to be restarted.

18.2. Create overview pages

After activating the “Generate device overview pages”, new overview pages with default settings will be created for all devices.

18.3. Reorder menu items

The order in which overview pages and devices are displayed in the list can be adjusted to your preference. Activate the reorder mode by clicking the “Edit menu order” button or by clicking and holding one of the elements for a few seconds. Sort the list items by clicking the arrow symbols and exit the reorder mode by clicking the check symbol on the right side of the window when done.

18.4. Units

Select the units to be used for temperature and flow values from the drop down menus. After changing these settings, the software will have to be restarted.

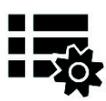
18.5. Event log

Events from various parts of the aquasuite can be saved to text files. Use the buttons to view the files either internally in the aquasuite or with an external program.

18.6. Application start-up

You may customize start-up behavior to suit your preferences. You may also select to hide the task bar symbol of the software when minimized.

18.7. Service administration



The background service configures special USB settings for all connected Aqua Computer devices, provides hardware data, software sensors, profile management, aquasuite web and Playground and should therefore always be active.

The hardware monitoring features of the background service can be disabled for specific categories if errors occur. Especially when using hardware monitoring software of different manufacturers at the same time, conflicts can occur when accessing data. Deactivate the hardware monitoring feature of the aquasuite or parts of it in this case.

When maintenance mode is activated, all optional modules of the background service are deactivated. This is useful in case of erroneous settings in the Playground, in particular if a system shutdown is configured and triggers too often. Therefore, in default configuration maintenance mode is automatically enabled if the computer is shut down three times by this feature (recommended setting).

18.8. Audio and video



The background service can analyze audio and video data and provide it to connected devices. Both functions can be enabled and disabled separately.

Notices for video analysis: Screen content preventing analysis by DRM or similar methods cannot be analyzed. If a graphics card is configured for variable refresh rate or a modified refresh rate, video analysis may fail; please deactivate this function in the graphics settings of the operating system if necessary.

18.9. Updates and update service

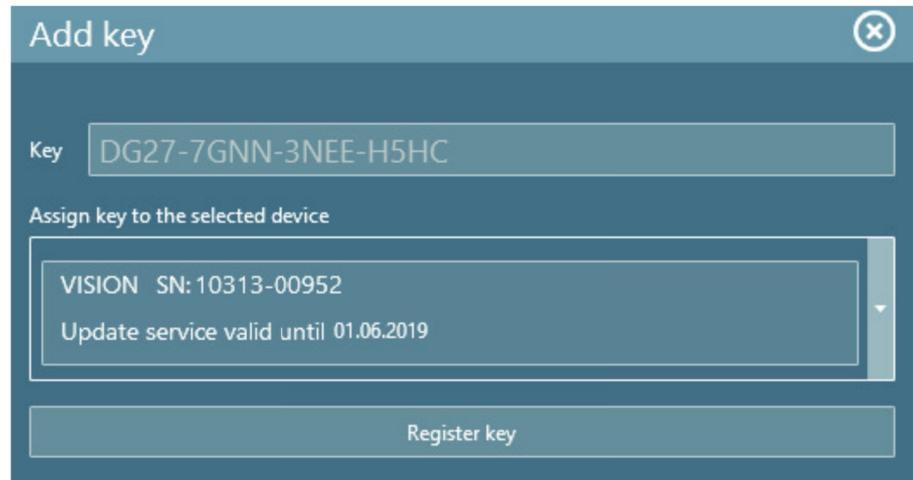


For software activation, all aquasuite versions starting with version 2017 require an active update service for the initial release date of the respective version. Update service periods are generally assigned to individual devices, brand-new devices automatically contain update service for a specific period depending on the type of the device. For software activation, at least one device in the computer must contain a corresponding update service period that includes the release date of this software version. If a valid update service period is detected for at least one device, all devices connected to the computer can be used with this version. It is not mandatory that each device has a corresponding update service period. For update service validation, the aquasuite requires an internet connection.

After successful validation, a file containing current data is stored on the computer. A re-validation is performed only if a new software version (update) is installed or upon connection of new devices. New devices can not be used prior to re-validation, even if other devices with corresponding update service periods are connected at the same time.

To purchase update service, please use the “Buy” button, which will open a website with current prices and payment options.

If you have received a key for update service with a device or bought one separately, you may enter the key after clicking the “Register” button. Select a currently connected USB device from the list for update service assignment. After clicking



the “Register key” button, the update service period is permanently assigned to the selected device and stored on the Aqua Computer update server. The key will not have to be re-entered after re-installation of the software or transfer of the device to another computer, but transferring the update service period to another device is not possible.

During update service validation and software activation, device serial numbers and a calculated computer ID are transmitted to and stored on the update server. No further personal information such as IP addresses are stored.

18.10. E-mail and MQTT accounts



Accounts for sending e-mail or MQTT messages can be configured. These accounts can then be used to send messages in the “Outputs” section of the Playground.

19. Technical details

19.1. Flow sensors, pressure sensors

| | |
|---|-----------------------------|
| Power supply voltage (USB/aquabus): | 5 V DC |
| Power supply current: | ca. 50 mA |
| Maximum current alarm output: | 100 mA, max. 30 V |
| Maximum pressure (pressure sensors): | 1 bar / 100 kPa |
| Connection threads pressure sensors: | M5 |
| Connection threads flow sensors: | G1/4 |
| Measuring range temperature sensor input: | -35 to 100 °C |
| Ambient temperature range: | 10 to 50 °C (noncondensing) |

19.2. D5 pump motor

| | |
|---|-----------------------------|
| Power supply voltage: | 8-24 V DC |
| Power consumption: | max. 37 W |
| Maximum current alarm output: | 100 mA, max. 30 V |
| Measuring range temperature sensor input: | -35 to 100 °C |
| Maximum coolant temperature: | 60 °C |
| Ambient temperature range: | 10 to 50 °C (noncondensing) |

19.3. Care instructions

Use a dry and soft cloth for cleaning. All electronic components and headers must not get in contact with coolant or water!

19.4. Waste disposal

This device has to be disposed of as electronic waste. Please check your local regulations for disposal of electronic waste.



19.5. Contact Aqua Computer

We are always happy to answer questions regarding our products and to receive feedback. For answers on frequently asked questions, please also check our website www.aqua-computer.de. You might also want to visit our forums and discuss our products with experienced moderators and thousands of members – available 24/7. To get in direct contact with our customer support team, we offer several options:

Email: support@aqua-computer.de

Postal address: Aqua Computer GmbH & Co. KG
Gelliehäuser Str. 1
37130 Gleichen
Germany

Tel: +49 (0) 5508 9749290 (9-16 h CET, German and English language)