Liquid-Check Levelsensor

Technical manual

Installation
Safety
Programming
Handling

https://liquid-check-info.si-elektronik.de

Congratulations

Congratulations on your purchase of this electronic level sensor "**Liquid-Check**" of the highest quality and thank you for your trust.

The level sensor **"Liquid-Check"** is designed to measure and transfer level levels of liquids in pressureless containers of all kinds.

The measuring range (container height) is 0 - 5 meter.

Before commissioning the device, we recommend this operating manual carefully read through.
Please also refer to the instructions on the use, the connection, as well as the safety and setting instructions.

Attention

We reserve the right to make mistakes or printing errors, as well as to make changes.
We are not liable for any damage, loss or cost incurred towards the buyer or third parties - by incorrect operation, Accident, misuse - or in case of improper repairs or connections.
Use only original replacements or accessories.
Furthermore, we are not liable for consequential damages and losses caused by caused by the use of this product.

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Sitemap

Preliminary

Delivery

1. Plug power supply 5 volt /1A with microUSB plug
2. Measuring module "Liquid-Check"
3. Fixing material
4. Measuring hose and hose weight (Optional)

When unpacking, check the kit for completeness.

Intended use

The intended use is to accurately measure a level of liquids in pressureless containers. E.g. water cisterns, tank contents, etc.

Liquid-Check was developed on the basis of the valid safety guidelines and built for use in European countries.

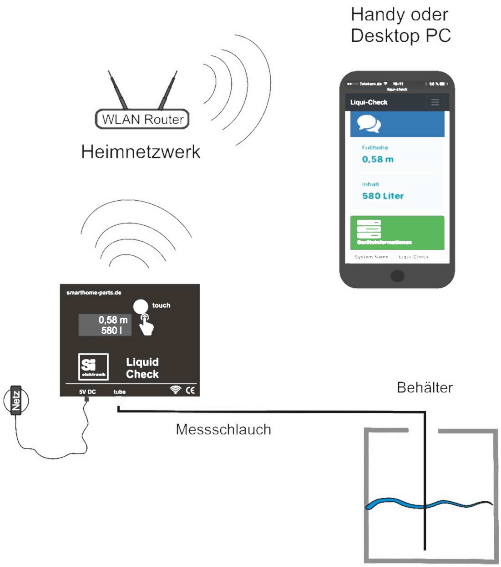
The electronic measuring system **"Liquid-Check"** allows the measurement of liquid levels. By specifying the shape of the container and the dimensions, the conversion into litres is also carried out. The main useful values are therefore, among other indications, the level of the liquid in metres and the amount of liquid in litres. The measured values are displayed via the digital display on the device as well as via A Wi-Fi connection via a PC or a mobile phone. Since the device has a local web page, the values can also be integrated into SmartHome systems that support reading values from web pages or HTTP-requests. A program module (see page 12) is available for the open source SmartHome system "FHEM".

Design of the device

The complete measuring unit including the LCD display and the W-Lan radio module are located in a small wall housing that is easy to assemble. The electronic components have no connection to the measuring medium.

The system is bundled with the container by a thin hose. The recommended measuring hose is available as an accessory and is made of polyurethane. An examination of the material compatibility with the measuring medium is recommended. Measurement hoses made of other materials can optionally be used for non-suitable measuring media.

The power supply for the system is supplied by a 5Volt plug-in power supply. For applications without available power supply, operation is possible, for example, via a solar-charged battery module.



How does Liquid-Check work?

The measurement method is based on a hydrostatic measurement of the liquid level in a container. Due to gravity, a liquid exerts pressure on the measuring hose positioned at or above the bottom of a container, depending on its specific density. By building up a back pressure, Liquid-Check can determine the corresponding value without being directly in or on the measuring object. Measurements based on the "hydrostatic principle" always determine the level of the liquid. Using the specified container shape parameters, Liquid-Check can also determine the volume content. Liquid-Check does not have to be attached directly to the container to be measured, but can be mounted for example in the nearby technical room. For the measurement, only a thin hose connection to the container or tank is required. The end of the hose must be positioned by a weight on or above the bottom of the container.

More information on Wikipedia:
https://de.wikipedia.org/wiki/Pneumatic level measurement

Liquid-Check offers the following features:

1. Accurate measurement absolutely
2. Accurate repetition measurement
3. Installation not necessary directly on the container/tank
4. No calibration required
5. Good Wi-Fi connection, as in-house assembly
6. Good power supply, as in-house assembly
7. Connection to the Wi-Fi network via the router's WPS button
8. Setting all parameters via local website
9. Responsive display on mobile phone
10. No separate app required
11. Setting different container shapes and dimensions
12. Entering a bearing table for complex container shapes
13. Measuring interval adjustable
14. Specific density of the liquid adjustable
15. Offset for measuring position (hose position above the ground)
16. Direct replacement of existing pump tank watches
17. Integration into smart home systems possible
18. FHEM - Module for integration into the open source SmartHome system available
19. Low acquisition costs

Installation of the Liquid-Check

Installation

1. Find a suitable assembly place
   Since the device is designed for indoor use, it is important to select a position from which you can establish a hose connection to the measuring object (tank). As a rule, there is already a pipe or hose connection from the house to a cistern or an earth tank, through which one can establish a corresponding connection. Measuring hose lengths up to 50m should not be a problem. A power outlet for the plug-in power supply should be in the immediate vicinity. You should also be able to connect to the W-Lan router from the installation site (See page 7). In advance, you can also check the Wi-Fi connection to your router with your mobile phone.

2. After a good position has been found, mount the Liquid-Check module with the enclosed fastening material.
   When drilling the dowel holes, pay attention to any cables or pipes that may be laid in the wall. Use a wire tester or have the module mounted by a specialist.

3. Route the hose connection from the measuring module to the corresponding tank. Plug the hose on the measuring module onto the hose connector (4mm), which is outstanding at the bottom, and fix the hose with the enclosed cable tie. **To make it easy to attach the hose**, it is recommended to **heat it with a hair dryer.**

   Attention: Do not bend the hose.
   Avoid abrasion points, possibly protect with protective tube.
   Always use a protective tube for wall bushings.

   In order to measure the correct filling height, the end of the hose must be guided to the bottom of the tank in question and fixed there. This can be achieved, for example, with a rod or with a weight at the end of the hose. Tanks that have an old measuring clock with hand pump already have a submersible pipe up to the tank bottom, which can be used accordingly. If the hose or the immersive tube does not end up to the bottom, but with a little distance above the bottom of the container, this can be taken into account in the settings of the liquid check.

4. **Note**
   Otherwise, no special requirements are placed on the installation. Height differences are not noticeable in the measurement result. The hose should not be left unnecessarily long, this will prolong the pumping cycle of the performed during a measurement.

   In the optionally orderable hose weight, the hose must be inserted approx. 12 mm into the quick-release fastener. To release the hose, the ring on the quick-release fastener must be pressed to release the hose again.

Electrical connection of the Liquid-Check

The Liquid-Check is powered by a plug-in power supply, which is included in the scope of delivery. The power supply has a micro-USB connector, which is plugged into the bottom of the case.

Overview Operating functions

Since all parameters of the liquid check are set and read via the local web interface, the module itself has only the most necessary operating functions.

1. WPS-Button

   Small hole to the right of the power plug

   - show IP-address - short press
   - activate WPS - > 3 Sek. press until display show „WPS...“
   - WLAN-Standard reset - > 10 Sek. press
     Switches on the WiFi access point (AP) of the Liquid-Check

2. Touch-Button

   Sensor button on the front

   - Trigger measurement - approx. 1 sec. touch

Connecting to Wi-Fi

Connection to the W-Lan via WPS function

Wi-Fi Protected Setup (WPS) is a feature that makes it very easy to connect to Wi-Fi. Two Wi-Fi-enabled devices are connected at the touch of a button. The cumbersome entry of a password via a configuration menu is no longer necessary. To do this, the following 2 operations must be performed.

Activating on the Wi-Fi router
To integrate Liquid-Check into the existing network, the WPS button must first be pressed on the W-Lan router or the WPS function must be activated in the setting interface of your router. If several WPS methods are available then select the push button method without PIN. If necessary, refer to your router's instructions under the "WPS" key point. Then, within 2 minutes, press the WPS function of the Liquid Check.

Activate at The Liquid Check:
To the right of the power supply plug is a small hole behind which there is a button (WPS button). For example, press the button with a curved paper clip for about 3 seconds to activate the WPS function. Once the display shows "WPS . . . / 120 sec." release the button again. The "ǂ" icon will now flash until the WPS connection is successful or after 2 minutes the connection is canceled. By short pressing the WPS button, the device displays its received IP address.

Connection via WiFi Access Point (AP)

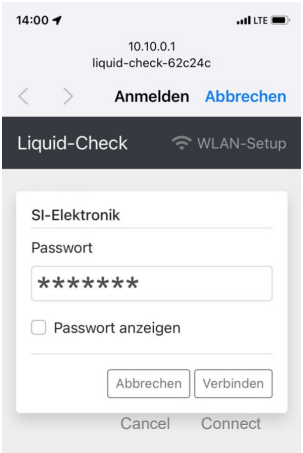
Only required if connection via WPS function (page 7) is not possible.
After installing Liquid-Check according to the installation instructions and plugging in the power supply, Liquid-Check will set up its own WiFi Access Point (AP).

In your phone/tablet, open Settings>WLAN and connect to the WLAN created by Liquid-Check, e.g. **liquid-check-62c24c**.

After a short scan of the environment, a pop-up automatically opens which displays nearby WLAN networks.

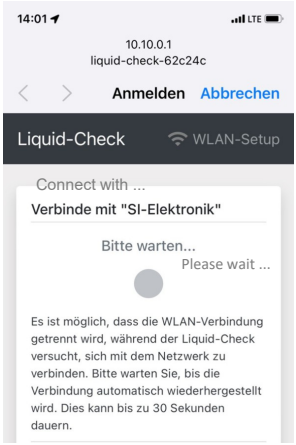
*If the pop-up does not open automatically, e.g. on older cell phones, you can also reach the window via the web browser by entering the **IP: 10.10.0.1***

Select the WiFi network to which Liquid-Check should connect.

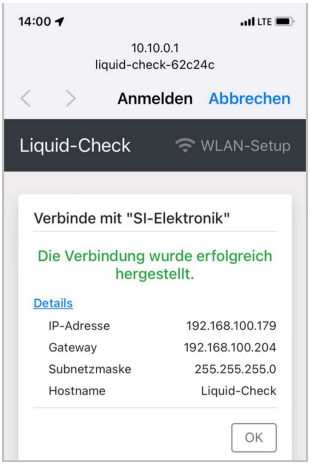


A window opens for entering the connection data (password)

After entering your password to your network and pressing the connect (Verbinden) button, Liquid-Check will connect to the selected network.



The new connection data for the Liquid Check is then displayed. If the connection fails, the phone/tablet remains connected to the WiFi AP so that further attempts can be made to log in to the home network.



After pressing the OK button, the WiFi AP is terminated and the phone/tablet usually reconnects to their home network

You can now connect to the web interface of Liquid-Check via a common internet browser (e.g. Goggle-Chrom, Firefox, MS-Edge, Opera, Safari) by entering the IP address in the address bar of the browser. If your router supports name resolution like the Fritz-Box 7390 and many others, then you can connect directly by entering the following in the browser address bar:

http://liquid-check

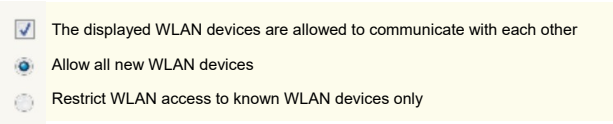
or scan QR-Code

The IP address can be displayed on the Liquid-Check at any time. To do this, press the WPS button (button behind the hole) on the Liquid-Check only briefly. The IP address displayed here enter in the browser search field: e.g. 192.168.100.179

Further on in chapter page (18) you will find instructions on how to place the web interface of the Liquid-Check like an APP on your home screen. (Mobile Phone settings)

Note
The Liquid-Check access point is available from firmware version 1.60. If the Liquid-Check access point is not used, then it switches off automatically after 5 minutes and can only be restarted via a WiFi reset (WPS button > 10 sec.)!

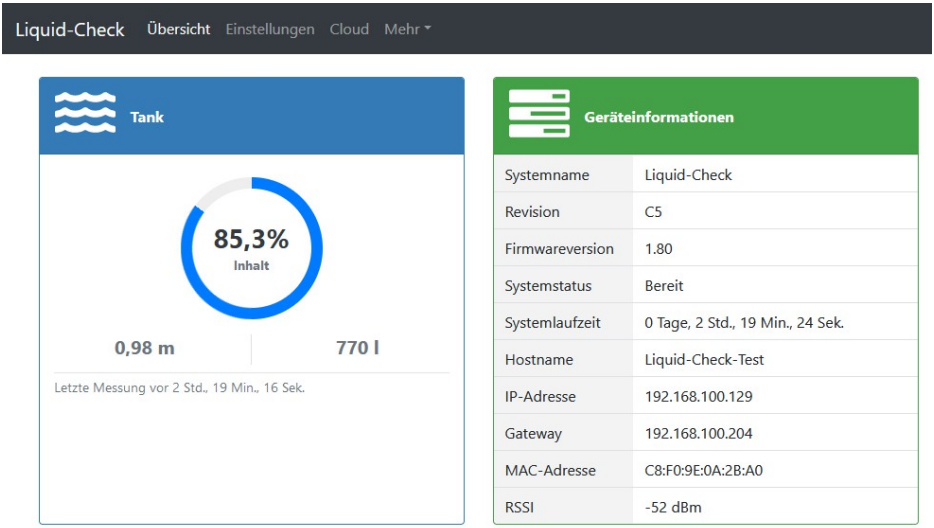
In order for other WLAN devices, e.g. a cell phone or a tablet PC, to connect to Liquid-Check, the router must allow WLAN devices to connect to each other and also allow new WLAN devices.
On a Fritz box router, for example, this option is enabled by default. You can find the setting there under WLAN/Security:



The WLAN guest setting may have its own radio buttons for enabling these features.

Browser view

Desktop view



Program menu

APP view on mobile

Note
In order for the fill level to be displayed in %, a Maximum fill level must be specified in the <Settings/Tank> menu.

Setting/viewing the parameters

Under the heading <Einstellungen> various parameters can be entered.
These are:

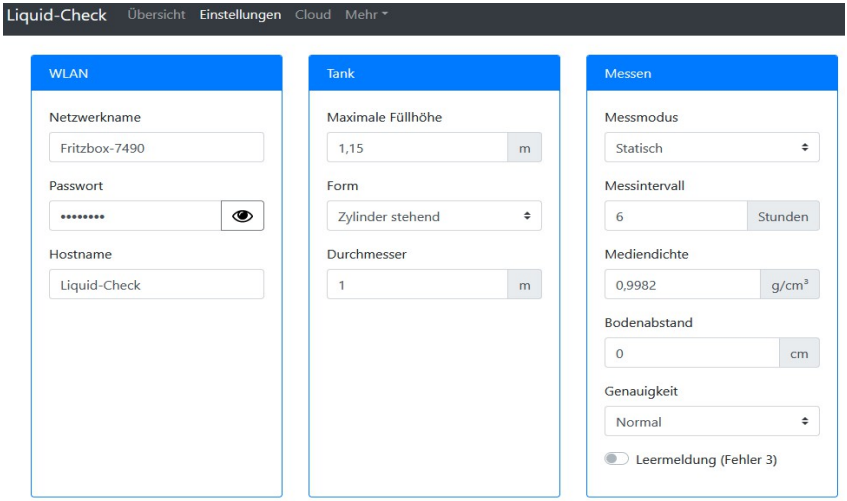
Wi-Fi connection data:
Access data to the Wi-Fi network and the host name that the module can usually use to access the module by pre-http:// in the web browser.

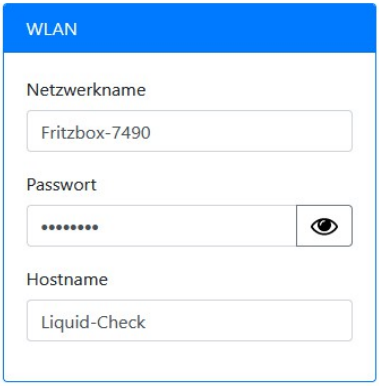
Tank: (Shape-parameters)
The length, height or diameter of the container to be measured, these are usually self-explanatory.

Messen: (Meassure)
Measuring interval: At what time interval a measurement is performed. The display always shows the last reading.
Media density: Water has a density of 1 g/cm3, heating oil (HEL) has a range of 0.82 -0.86 g/cm3. On average, therefore, about 0.84 g/cm3

Bodenabstand: (Distance to the tank bottom)
Correction value, how much the measuring hose (or tube) is positioned above the ground.

Note If a web browser does not accept the number entry with comma (,), try it with a point (.)



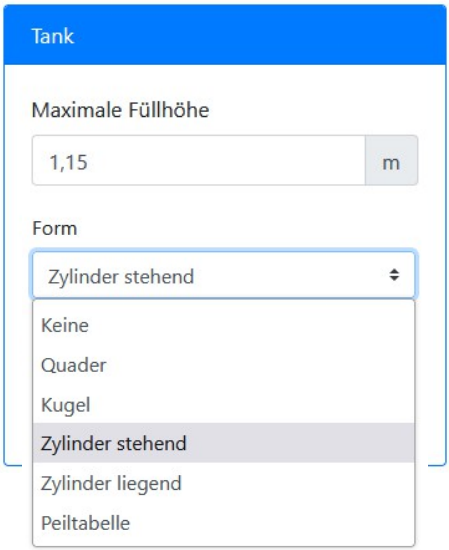


WLAN parameters

In this menu, the access data to the home network and the host name can be changed.

Tank-Shapes

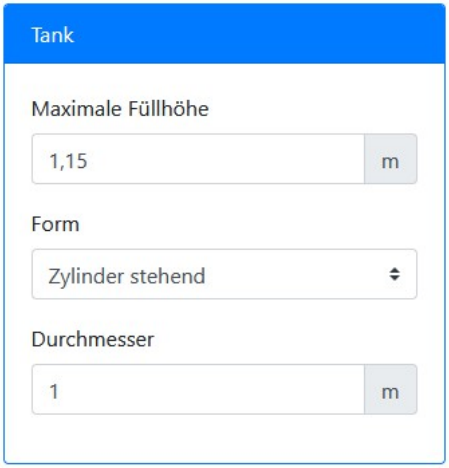
From the measurement of the height of the liquid, the volume can be determined in litres. To do this, the tank shape used and the corresponding dimensions must be entered.



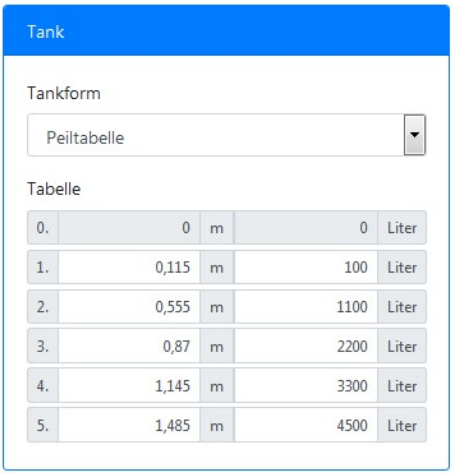
Standard tank shapes

The maximum fill level is required exclusively for the display of the percentage gauge. The value can also be entered at a later time. E.g. if the max. filling level is not yet known, it can be read off in the overview when the tank is full and entered here.

Various geometric shapes are available here.
- Box, - Ball, - Cylinder standing
- Cylinder lying, - Bearing table



Here you can specify the dimensions for the selected tank shape.



Bearing table for complex tank shapes

If the tank does not correspond to any of the above shapes, then the contents can also be determined using a bearing table.
A bearing table is provided by most tank manufacturers. Up to 30 values can be preset.

Consideration of measurement accuracy

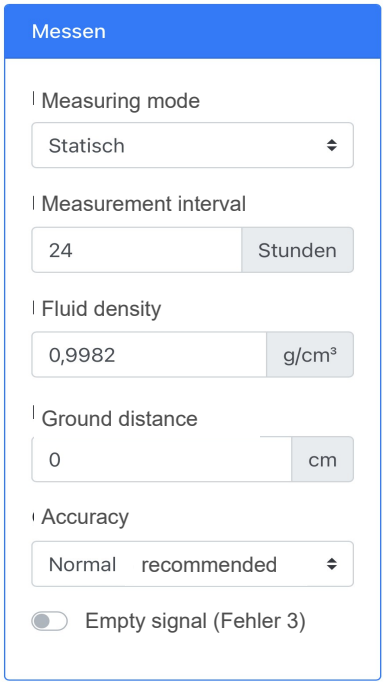
Liquid-Check measures a liquid level (level height) during an active measurement with an accuracy of +/- 1cm.

Measuring mode "Static“

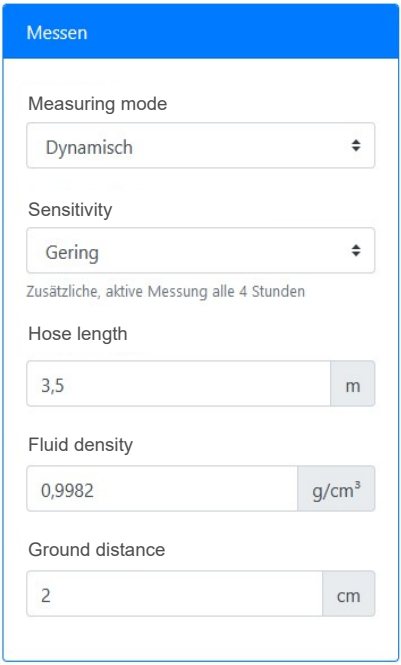
The active measurements are performed after an adjustable interval, when the touch button is pressed or when activated via the web interface. For containers with probably slow level changes, e.g. oil tanks or similar, it is sufficient to perform the measurement interval every 6, 12 or even 24 hrs. The shortest interval can be set to 0.25 hours.

Accuracy

An average value formed by several measurements one after the other increases the accuracy of the raw measurement values and reduces the up/down switching of the display at a cm limit. This can be used mainly in applications with slow level change, e.g. oil tank



Empty message:
When the container is empty, "Fehler 3" can be displayed.



Measuring mode "Dynamic“

The dynamic interval function automatically detects, without performing an active measurement, whether a liquid level is falling or rising. However, this must be a significant change. As soon as a corresponding level change is detected, an accurate (active) measurement is performed. The sensitivity of the dynamic interval can be set in 5 steps (low, normal, medium, high, max). Also with the dynamic interval an active measurement takes place in certain time intervals (see table).

Hose length: (Schlauchlänge)
Specify the approximate length of the measuring hose used.

Media density (Mediendichte)
Here 0.9982 g/cm³ for water
For light heating oil HEL, it is in the range of 0.82 - 0.86, 0.84 would have to be entered, for example.

Ground distance (Bodenabstand)
The end of the hose hangs here in the example 2cm above the tank bottom.

Measuring mode "Dynamic", table for measuring hose length 10m

Step	Detects level changes automatically		Additional active
	falling Level	**rising Level**	**Measurement every**
gering	> 10cm	> 24cm	4 hours
normal	> 8cm	> 17cm	2 hours
mittel	> 7cm	> 13cm	1 hours
hoch	> 6cm	> 12cm	0,5 hours
max	> 5cm	> 11cm	0,25 hours

Measuring mode "Dynamic", table for measuring hose length 20m

Step	Detects level changes automatically		Additional active
	falling Level	**rising Level**	**Measurement every**
gering	> 10cm	> 35cm	4 hours
normal	> 8cm	> 22cm	2 hours
mittel	> 7cm	> 16cm	1 hours
hoch	> 6cm	> 12cm	0,5 hours
max	> 5cm	> 11cm	0,25 hours

Measuring mode "Dynamic", table for measuring hose length 30m

Step	Detects level changes automatically		Additional active
	falling Level	**rising Level**	**Measurement every**
gering	> 10cm	> 50cm	4 hours
normal	> 8cm	> 30cm	2 hours
mittel	> 7cm	> 20cm	1 hours
hoch	> 6cm	> 15cm	0,5 hours
max	> 5cm	> 13cm	0,25 hours

Conclusion of the tables
Shorter measuring hose lengths increase the response sensitivity as the level rises. Specify the tube length you are using in the Liquid Check settings menu. The tables show the typical response sensitivities of the dynamic stages. In case of large temperature changes in short time intervals, as well as small leaks in the hose system, the values may deviate.

SmartHome integration

Liquid-Check can be integrated into SmartHome systems. The systems must have a possibility to take over the data from the website or to retrieve it via http from a website.

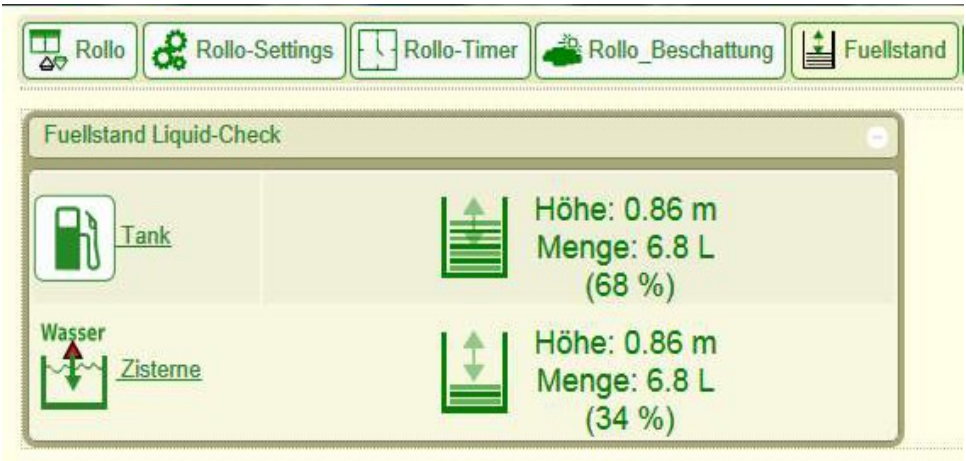
Liquid-Check provides all relevant data in JSON format with the following URL query.

http://liquid-check/infos.json

For the integration into the open source SmartHome system "FHEM" a ready-to-use module with download and installation instructions is published at "Github":

https://roma61.github.io/Liquid-Check/

Example for an integration of the measured values in a FHEM dashboard



Other SmartHome systems in which Liquid-Check has already been successfully integrated include the following:

LOXONE

openHAB

FIBARO Home Center 3

Home Assistant

KNX über Gira X1

Liquid-Check Cloud

Liquid-Check powerd by Grafana

Liquid-Check" has an interface to our web portal for recording your measured values. Our server uses the visualization software "Grafana". Here your levels and quantities can be stored and displayed graphically (See picture). Through your personal login you have the possibility to monitor the graphics also at another location via PC web browser or via cell phone. Also an alarm level can be defined, which occurs when the level is exceeded or fallen below and then sends a notification by mail.notification by mail.

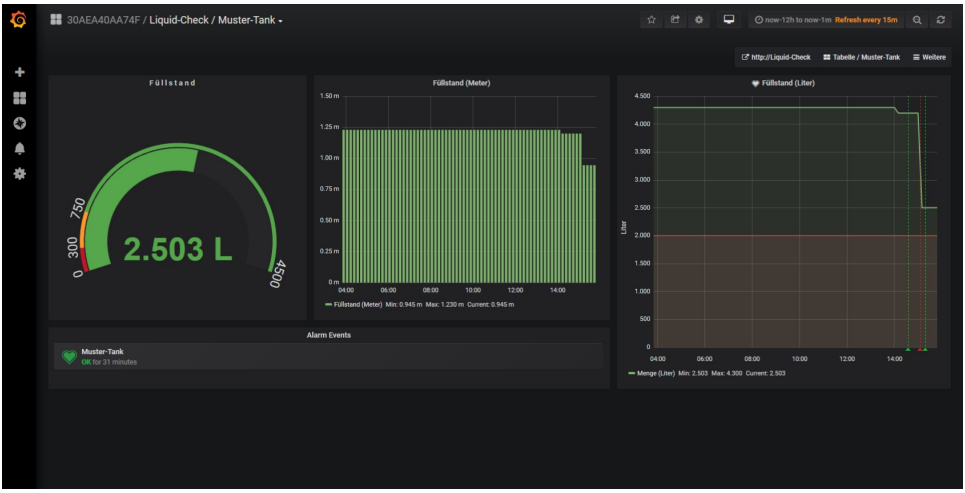
When you activate the cloud function on the setup page of the Liquid Check, you will receive the access data to the web portal.

Your data is protected by an https connection, as well as by an individual security key.

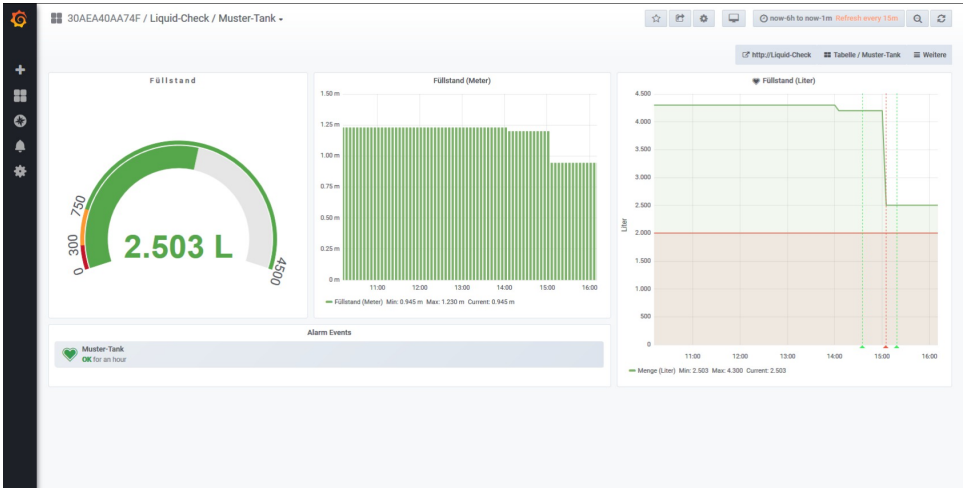
Link to the login page:

https://liquidcheck.si-elektronik.de

View of the graphic in the "Dark" style



View of the graphic in the "Light" style



Once the cloud function is activated, Liquid-Check sends its last measurement to the portal cyclically every hour. In addition, the data is immediately sent to the portal when measured values change.

The following data is required for activation:

E-Mail : User's e-mail address
Größe : Maximum amount of filling of the container to be measured
Bezeichnung : Short description of the container e.g. cistern garden

Optionally:
Alarmwert : Filling quantity at which a notification should be made
Benachrichtigung : Notification when the value is above or below

Multiple devices can be managed by activating with the same <e-mail> in one account.

If the cloud function is deactivated in the "Liquid Check" setup page, measurement data will no longer be sent to the web portal. The data that has already been stored is retained in the cloud.

Deleting the cloud account on the "Liquid Check" setup page causes the account to be completely deleted, as well as the recorded measurement data.

Mobile Phone Settings

Save Liquid-Check Cloud or web interface as an APP in the Home screen.
The Liquid-Check page can be shown as a separate application in your apps and then starts as full screen without browser border.

Apple iPhone

Launch the Safari browser and enter the following link in the browser line:
https://liquidcheck.si-elektronik.de (For accessing the cloud)

or

http://liquid-check (To call the local Liquid-Check web interface)

If you have selected the link for cloud access, you will see the login page of the Liquid-Check Cloud (powered by Grafana). Here you enter the email address you used to activate the account in Liquid-Check and the password you receive.
To avoid login in the future, click on the key symbol in your on-screen keyboard to save the login data in the cell phone. Then press the "Log In" button in Grafana. The Liquid-Check Cloud will now appear with the corresponding graphics.

So that your browser window is now visible as an app on your home screen:

Click the share icon

And now select " To Home Screen" from the list. After that, the "Liquid-Check Cloud" or the "Liquid-Check Web Interface" will be displayed like a separate application with your apps on the home screen.

Android Chrome

Start the Chrome browser and enter the link into the browser line as already described above under iPhone.
So that your corresponding browser window is now visible as an app on your start screen, tap in your browser on the top right on the three dots and select "Add to start screen".

Danach wird die „Liquid-Check Cloud“ oder die „Liquid-Check Weboberfläche“ wie eine eigene Anwendung bei Ihren Apps angezeigt.

Technical data

Power supply	:	5 V DC / 1 A Plug power supply, microUSB
Power consumption	:	0,3 W Normal / 3 W active measurement cycle
Pump Pressure Max	:	0,5 BAR
Weight	:	0,2 kg
Dimensions L/B/H	:	131mm x 90mm x 48mm
Device installation position	:	Any
Accuracy	:	+/- 1cm
Temperature range	:	-5/+45°C
Protection class	:	IP30
Supported web browsers	:	Goggle-Chrom, Firefox, MS-Edge, Opera, Safari
Recommended measuring hose:		Polyester-Polyurethan 6 x 4, •small bending radius due to special flexibility •very good refrigeration flexibility and reset properties •kink- and abrasion-resistant •resistant to aliphatic hydrocarbons and most lubricants

TX Frequenz	Wi-Fi: 2412-2472/2422-2462 MHz
RX Frequenz	Wi-Fi: 2412-2472/2422-2462 MHz
ITU Klassifizierung	G1D, D1D, F1D
Ausgangsleistung	Wi-Fi: 16,62 dBm (802.11b), 16,23 dBm (802.11g) 16.45 dBm (802.11n20), 16,02 dBm (802.11n40)
Modulation	Wi-Fi: DSSS, OFDM
Antenne	PCB Antenne, 2.0 dBi

EG-conformity

Produktname : Liquid-Check
Typ : LC1

Complies with the provisions of the EC directives listed.

Requirement	Standard, Testreport Number, Date & Laboratory
Radio Spectrum	EN 300 328 V2.1.1 (2016-11) Test Report RKS170508002-00A issued on 2017-05-10 by BACL, Kunshan EN 300 328 V2.1.1 (2016-11) Test Report RKS170508002-00B issued on 2017-05-10 by BACL, Kunshan EN 300 328 V2.1.1 (2016-11) Test Report RKS170508002-00C issued on 2017-05-10 by BACL, Kunshan
EMC	EN 301 489-1 V2.2.0 (2017-03), EN 301 489-17 V3.2.0 (2017-03) Test Report RKS170508002-00E issued on 2017-05-18 by BACL, Kunshan
Safety	EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2:2013 Test Report RKS170508002-03 issued on 2017-05-18 by BACL, Kunshan
Health	EN 62311:2008 Test Report RKS170508002-00D issued on 2017-05-18 by BACL, Kunshan

Environmental protection notes

Device

SI-Elektronik GmbH
WEE-Reg.-Nr. DE 10953817

The symbol of the crossed-out dustbin indicates that this electrical or electronic equipment must not be disposed of with household waste at the end of its service life, but must be taken for separate collection by the end user. Free collection points for old electrical equipment are available in your area for the return of the equipment, as well as other acceptance points for the reuse of the equipment, if applicable. You can obtain the addresses from your city or local government.
Distributors with a sales area for electrical and electronic equipment of at least 400 square meters and distributors of foodstuffs with a total sales area of at least 800 square meters who offer electrical and electronic equipment several times in a calendar year or permanently and make it available on the market are also obliged to take back old electrical and electronic equipment free of charge. When supplying a new EEE to an end user, they must take back free of charge an old EEE of the end user of the same type that fulfills essentially the same functions as the new EEE, at the place of supply or in the immediate vicinity thereof, and, without purchasing an EEE, take back free of charge at the end user's request up to three old EEEs per type that do not exceed 25 centimeters in any external dimension, in the retail store or in the immediate vicinity thereof. In the case of distribution using means of distance communication, all storage and shipping areas shall be deemed to be sales areas of the distributor.
If the old electrical or electronic equipment contains personal data, you are responsible for deleting it yourself before returning it. If this is possible without destroying the old electrical or electronic equipment, please remove old batteries or rechargeable batteries as well as old lamps before returning it for disposal and take them to a separate collection. Further information on the Electrical and Electronic Equipment Act can be found at
www.elektrogesetz.de.

Packaging

When disposing of the packaging, please observe the applicable laws on environmental protection and waste disposal. Disposal of the outer packaging is possible through normal household waste disposal. Do not carelessly leave the packaging material lying around. This could become a dangerous toy for children!

Appendix A

Error handling

Error	Possible reason	Solution
The Internet browser cannot load http://liquid-check.	Your router may not be able to resolve names.	Display the IP address on the liquid check and use it in the web browser. IP display: Click 1x with a paper clip into the hole at the bottom of the device.
You did not write down the password for the Grafana graphics page during cloud activation and therefore cannot log in.	Forgotten password	Use the "Forgot your password?" function in the Grafana graphic page login. Enter here the e-mail with which you created the account.
Fehler Nr. 1 (error 1) During the pressure build-up in the measuring phase, no defined, maximum pressure peak can be determined due to strong pressure fluctuations.	Very strongly moving liquid, leakage in the pressure hose, pressure pump stoppage	Check if one of the possible causes exists.
Fehler Nr. 2 (error 2) After the pressure builds up in the measuring phase, the pressure drops steadily and no standing pressure point can be measured.	Leak in the measuring tube or liquid check	Prüfen Sie den Schlauch und die Verbindungen auf Dichtheit.
Fehler Nr. 3 (error 3) No pressure increase can be detected after starting the pumping process.	The measuring hose is not plugged on or has a severe leak.	Check whether the hose is plugged on! Check the hose for a strong leakage.
Fehler Nr. 9 (error 9) Only when using the additional circuit board. A temperature sensor used in a logic link no longer transmits data.	Wire break to the temp. sensor or a defect in the sensor itself.	Check the cable connection to the temp. sensor. Or replace the sensor.

Scan QR code to open Liquid-Check
in your web browser.

Liquid-Check must already be connected to your
local network.

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