Document Information:

Topic	Application Note CAPBs
Products	CAPBs sens WQ10 (**W**ater **Q**uality)
Author	Matthias Trautmann

History:

Version	Date	Name	Description
1	04.02.19	MT	Initial release

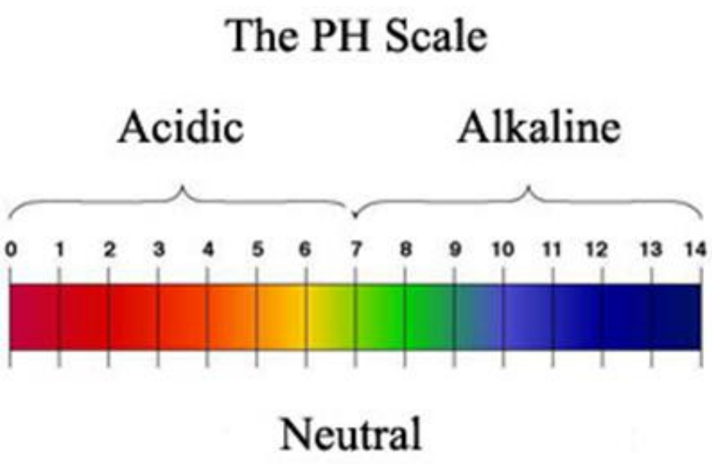
1. Introduction

This file provides application information for the CAPBs sens WQ10.

2. Description

The CAPBs sens WQ10 is to determine the water quality using different parameters. It measures pH, electrical conductivity and temperature. Salinity, TDS and harness grade are derived from the conductivity reading using different factors.

pH value is a logarithmic scale used to specify the acidity or basicity.



The WQ10 glass electrode consists of a small bulb of special glass that contains a solution of known hydrogen ion concentration (KCL 'buffer solution') and an internal reference electrode. Therefore, it is important protect the electrode with the KCL (Potassium chloride) solution in the cover.

Conductivity is a measurement of how well an aqueous solution can carry an electrical current. It is commonly used to determine the levels of impurities in the water, typically the more impurities in the water, the higher the conductivity value will be. Electrical conductivity is measured micro Siemens per centimeters [µS/cm] or milli Siemens per centimeters [mS/cm]. Absolutely pure water has a conductivity value around 0.055 µS/cm, tap water typically has a value around 50-100 µS/cm and sea water normally has a value around 53 mS/cm. To take a conductivity measurement, two plates are placed into the sample, a potential is applied across the plates, and the current is measured. For most salts, there is a linear relationship between ion concentration and the conductivity value.

TDS, short for Total Dissolved Solids, is an estimate of the mass of dissolved solids within the solution and is typically expressed as milligrams per liter [mg/l] or grams per liter [g/l]. It is derived from the conductivity reading using a conversion factor. For accurate TDS readings, the correct TDS factor must be used. For example, a sodium chloride solution has a TDS factor of around 0.49, whereas a sodium bicarbonate solution has a TDS factor of 0.91. If you are unsure of the TDS factor for your water sample, you can send it to a lab for analysis and they can analyze it for you. The CAPBs sens WQ10 has the default factor 0.65, but this factor could be changed in the program

Salinity is similar to TDS in that is an estimate of the level of salt in a water sample and it is derived from the conductivity reading using a conversion factor 0.5. It is typically expressed as parts per millions [ppm] or parts per thousand [ppt]. Salinity readings are typically used by industries such as agriculture, hydroponics, and pool and spa monitoring.

“**German Grade °dH**” (Deutsche Härte) is derived from the conductivity reading using a conversion factor 0.028.

“**Englische Grad °e**” (Grad Clark) is derived from the conductivity reading using a conversion factor 0.022.

“**French Grade °fH**” (Degré français) is derived from the conductivity reading using a conversion factor 0.01568.

“**Russian Grad °rH**” is derived from the conductivity reading using a conversion factor 0.0039.

“**$CaCO_3$ ppm**” (USA) is derived from the conductivity reading using a conversion factor 0.00157.

“**Earth alkali ions mg/l“** (mval/l) is derived from the conductivity reading using a conversion factor 0.0784.

“**Earth alkali ions mmol/l“** is derived from the conductivity reading using a conversion factor 0.1568.

Temperature is measured to compensate the pH and conductivity values, because they are temperature-dependent. The default temperature reference is set to 25 °C and can be set in the program.

3. Application: VDI 2035 - Prevention of damage in water heating installations Water-side corrosion

The German Guideline VDI 2035 Part 2 applies to water heating installations according to EN 12828 / DIN EN 14868

The probability of corrosion damage in the water heating installation will be minimized if the guide values for heating water shown in Table 1 are observed.

<u>Aluminium and aluminium alloys (section 7.4):</u>

Due their good thermal conductivity and low density, aluminium and aluminium alloys are used for radiators and in heat generation. The corrosion behaviour of aluminium materials is determined primarily by the pH value of the heating water. In water aluminium forms aluminium oxide films which in the pH value range of 6,5 to 8,5 relevant to water heating installations represent stable top layers. The top layer can be broken up by either acidic or alkaline heating water. Should the protective layers be broken up or destroyed, uniform corrosion of aluminium can proceed unimpeded. At the same time, corrosive effects or damage occur in the water heating installation due to the formation of hydrogen which is taking place. For this reason, corrosion damage can be found not only with heating water containing oxygen but also with oxygen-free heating water. When aluminium materials are used in installations with untreated filling and make-up water no impairment is to be expected provided there is compliance with the pH value range mentioned.

As a rule, there is no need to alkalinize the filling and make-up water since due to self-alkanization the pH value of the heating water stabilizes within the range mentioned within a few weeks of operation. If the pH value of the filling water is considerably lower than 8,2, it is recommended that the pH value of the heating water be checked after eight to twelve weeks but no later than during the next annual maintenance. Only if inspection shows the pH value of the heating water still to be considerably lower than 8,2 should alkalinization be implemented, while taking Table 1 into consideration.

Table 1. Guide values for the heating water

		Low-saline	**Saline**
Electrical conductivity at 25 °C	µS/cm	< 100	100–1500
Appearance		free of sedimentating substances	
pH value at 25 °C		8,2–10,0*)	