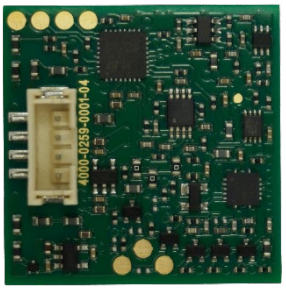
PRELIMINARY PRODUCT INFORMATION



QCRC-A3 PRODUCT FEATURES

- Fluid quality & fluid property measurement by EBE's patented corTEC® sensor technology
- Allow measurement of capacitive and conductive values
- Suitable for almost any applications
- Non-contact sensing through container walls and tubes
- Excellent sensitivity and repeatability even with media of the lowest dielectric constants (even $\varepsilon_r < 2$)
- Easy communication with I^2C, various option on request
- US Patent Pending

FLUID QUALITY MEASUREMENT

QCRC sensors from EBE allow in real time both capacitive and conductive (through resistive readings) measurement of gases, liquids, solids and even highly viscous media. All measurement is contact-free to the media. This enables detailed analysis of the media and a degree of selectivity of the media usually requiring at least 2 separate measuring instruments. corTEC® capacitive measurement ranges from 600fF to 1550fF for detection of media in a relative permittivity (ε_r) range of vacuum (=1) through oils and solids (typ. <5) all the way to water (typ. 80) and higher. A conductance measurement range is possible from about 150 to 285uS (3500 to 6500 Ohm) which converts to conductivity (values depending on application details). Other ranges and versions on request.

Preliminary

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PRODUCT DESCRIPTION

The QCRC-A3 standard electronics is designed to allow easy integration in OEM and various industry measurement devices. I^2C and other outputs allow for easy communication due to its simplicity and flexibility. The miniature size caters to various OEM integration needs, fitting into compact spaces. EBE's corTEC® measurement technology can detect a vast range of materials like powders, solids, oils, water-based liquids, and high viscosity substances even with the lowest dielectric constants of $\varepsilon_r < 2$. The measurement electrodes are conveniently located at the backside of the sensor, ensuring precise and efficient functionality over long periods of time. The QCRC electronics are REACH/RoHS compliant (EU). For UL compliance please contact EBE.The QCRC is intended for non-invasive impedance measurement applications in which the sensor is attached to the outside surface of a tank, hose, or pipe. The sensor determines the electrical impedance characteristics of the medium contained within the vessel or pipeline.

The electrical properties of the medium are represented by an equivalent parallel RC network consisting of capacitance and a resistance. In practice, the measured impedance is affected by coupling layers between the sensor and the medium, as well as by the sensor input impedance. These effects can be modeled as additional series impedances superimposed on the medium impedance.

Extensive application experience has shown that the sensor's capacitive and resistive measurement ranges are ideally suited for the majority of industrial media sensing applications. High resolution and excellent noise performance allow reliable differentiation and monitoring of a wide range of materials.

The sensor outputs the calculated impedance as independent capacitive and resistive measurement values. An integrated auto-calibration mechanism minimizes temperature-dependent electronic drift, providing stable and repeatable measurements over the entire operating temperature range.

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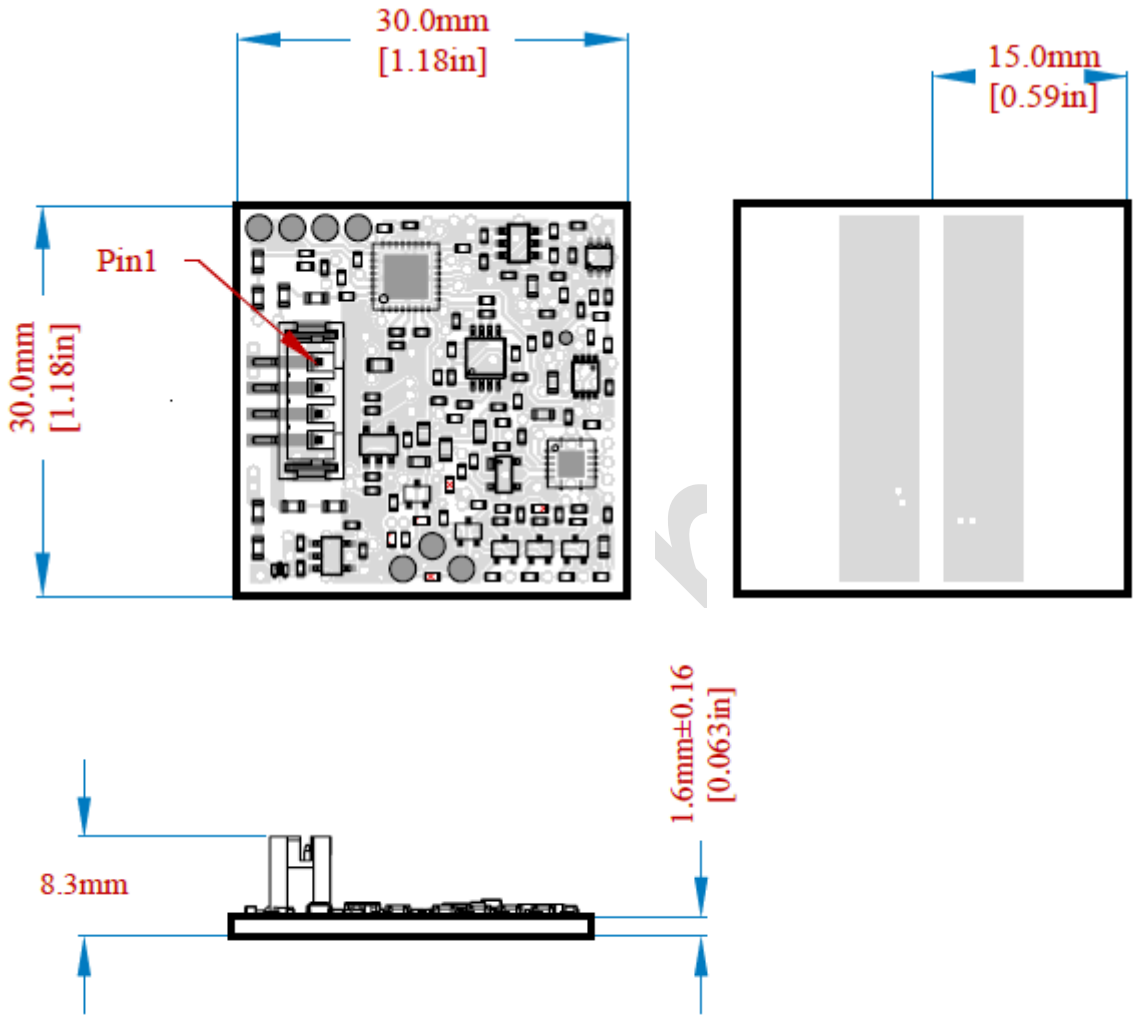
PRODUCT SPECIFICATIONS

DIMENSION	SEE OUTLINE DRAWING
MEASUREMENT TYPE	corTEC®
MEDIA PERMITTIVITY	ε_r = 1.5 … 120
MEDIA CONDUCTIVITY	Typ. 0.01 … 1000 mS
CAPACITIVE SIGNAL RANGE	600 ... 1550 fF
CAPACITIVE TEMPERATURE COEFFICIENT	typ. ± 10 ppm / °C
RESISTIVE (CONDUCTIVE) SIGNAL RANGE	3500 … +6500 Ohm (150 … 285 uS)
RESISTIVE (CONDUCTIVE) TEMP. COEF.	typ. ± 50 ppm / °C
STEP RESPONSE TIME (10-90%)	typ. 100 ms
UPDATE RATE	typ. 30 ms
RESOLUTION	typ. 18 bit
ENOB	typ. 16 bit
POWER SUPPLY (VCC)	5 VDC ± 0.25 VDC, 30mA max.
OUTPUT	I²C (opt. switching outputs)
I2C INTERNAL PULL-UP-RESISTORS	3300 Ohm
SWITCHING OUTPUT INTERNAL RESISTOR	50 Ohm
OPERATING TEMPERATURE RANGE	-25 °C to +85 °C (extended range on request)
STORAGE TEMPERATURE RANGE	-40 °C to +85 °C
HUMIDITY	0 – 95 %r.H., non-condensing
PROTECTION CLASS	IP 20
POWER-UP TIME	1.2 s

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OUTLINE DRAWING



ELECTRICAL CONNECTIONS

A 2mm (0.079”) 4-pole shrouded SMT header is assembled on the sensor PCB. To avoid mechanical stress on the connector, a cable fixation shall be used to avoid damaging the sensor.

Pin	I²C	Switching Output[1.)]
1	VCC	VCC
2	SDA	SW1
3	SCL	SW2
4	GND	GND

[1.)]EBE offers sensor interface boxes including software to allow switching outputs to be set and adjusted.

Possible connectors (female crimp housing 4-pole) for the sensor is Würth Elektronik WR-WTB 2.00mm (620004113322, crimp contact 62000113722 / 62000113722DEC). Other compatible connectors are possible a well.

MOUNTING

To get best sensor performance, please ensure the following mounting guidelines:

- Do not use metal screws or any metallic object to fix the sensor onto your container. Plastic mounting clips are therefore recommended.
- Gluing tape should be used to remove any air gaps between sensor electrodes and mounting wall. Possible tape includes e.g. 3M 4910F or Tesa 4965. Use the tape over the complete sensor electrode side.
- Keep air-distance between sensor and container wall as small as possible.
- Avoid

Grounding: No special grounding to PE (protective earth) is necessary for this sensor. Based on the sensor’s design, the level sensor is decoupled from PE. To get best results, a stable power supply with reduced ripple noise or additional filter is recommended.

EMC: To further improve robustness of the sensor, a common mode choke may be placed in the power path to reduce EMC susceptibility.

Orientation: For level measurement, the sensor electrodes are typical oriented perpendicular to the fill level.

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ADDITIONAL INFORMATION

Customizations

EBE customizes sensors according to the specific requirements and characteristics of the customer's application. The corTEC®'s measurement technology enables precise adaptation to confined spaces and difficult conditions. EBE's engineers support plug and play integration into custom OEM devices.

Sensor Evaluation Kit – Quick Introduction to Applications

EBE offers sensor evaluation kits for immediate readiness for use. The data is transmitted via adapter box to the PC. This allows customers to test the performance of the sensors in their own applications. The download link for the associated EBE Sensor Control Software can be found at https://www.ebe.de/download-center/.

Application Examples

QCRC sensors can be used in a variety of fluid property detection applications, e.g.:

Concentration measurement: saline solutions with different concentrations will provide all a rather similar capacitive value while EBE's fluid quality sensor will still provide selectivity means through different resistive values (due to different conductivity) which allows determining the differences in concentration.

Air detection in (ultrapure) water: the relative permittivity (ε_r) of air is close to 1 while liquid media containing water will always be in a double-digit range of ε_r. The difference of air to (ultrapure) water is easily detected by capacitive measurements (while both air and ultrapure water are known isolators with very small conductivities of less than 0.1µS/cm).

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SAFETY AND WARNING NOTES

The components are solely for use by technically qualified, professional electronics experts who are familiar to the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. User assumes all responsibility and liability for proper and safe handling and use and agrees with the restrictions and disclaimer at the end of this document.

DISCLAIMER

The information contained in this document is for general guidance only. The user is responsible for determining the suitability of the technical information referred herein for his application. On delivery of the component, EBE is only obliged to implement those properties set out and agreed upon in this document. Further properties are not included. No guarantee is given. The component has been designed for installation in our customer's products. Manufacturer of the resulting product and consequent liability according to the Product Liability Act lies with the customer. Warranty is limited to below mentioned extent.

The component is not intended for installation in end products for medical, life-saving, or safety-related applications. The use of the component is also not permitted and expressly prohibited in vehicles of any kind (including trailers and watercraft), as a component in aerospace products (including radio transmitter for aerospace purposes), or in offshore structures.

User assumes all responsibility and liability to determine whether the component is subject to any applicable international, federal, state, or local laws and regulations related to user's handling and use of the component and, if applicable, user assumes all responsibility and liability for compliance in all respects with such laws and regulations.

Disclaimer for improper use
The manufacturer accepts no liability for damage resulting from improper, inappropriate, or non-compliant use of the component. Any liability for direct or indirect damage, consequential damage or loss resulting from improper use is excluded. The Customer (user) is obliged to use the component exclusively in accordance with the instructions and information given in this document.

The limitation of liability described above does not apply in the case of mandatory statutory liability such as under the German Product Liability Act (Produkthaftungsgesetz) or in the case that a guarantee is given or in the case of willful deceit or fraudulent misrepresentation or with regard to claims for an injury of the life or limb or health or in the case of intentional or grossly negligent breach of fundamental contractual duties (“wesentliche Vertragspflichten”).

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