iCon RF140 transducers

The technology

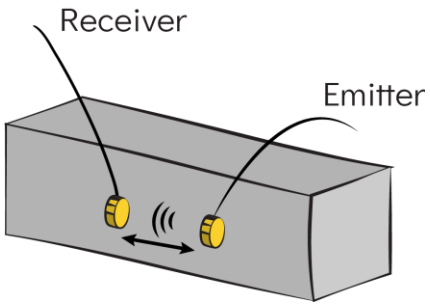
iCon RF140 are resonant piezoelectric ultrasonic transducers especially designed to be embedded in concrete for the generation and measurement of mechanical ultrasonic waves. The transducers can be used in passive or active ultrasonic testing. They do not require the use of any coupling agent, and the wave propagation to and from the transducers is excellent, even at low voltages. When embedded in concrete, their resonant freqeuncy is around **140 kHz**.

Hardware interface

iCon RF140 transducers are delivered with BNC type connectors and can be coupled to any commercial hardware and software for ultrasonic testing (see the impedance curves of the transducers for compatibility)

Key advantages of the technology

- Excellent signal to noise ratio
- Repeatability of the measurements
- Possibility of remote and automated continuous monitoring
- Low-cost

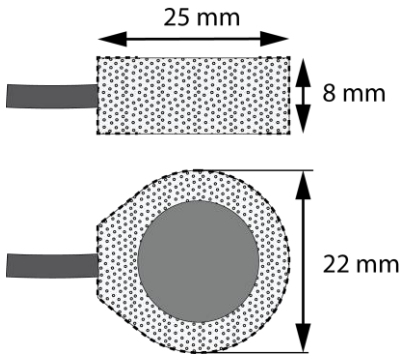


Potential applications

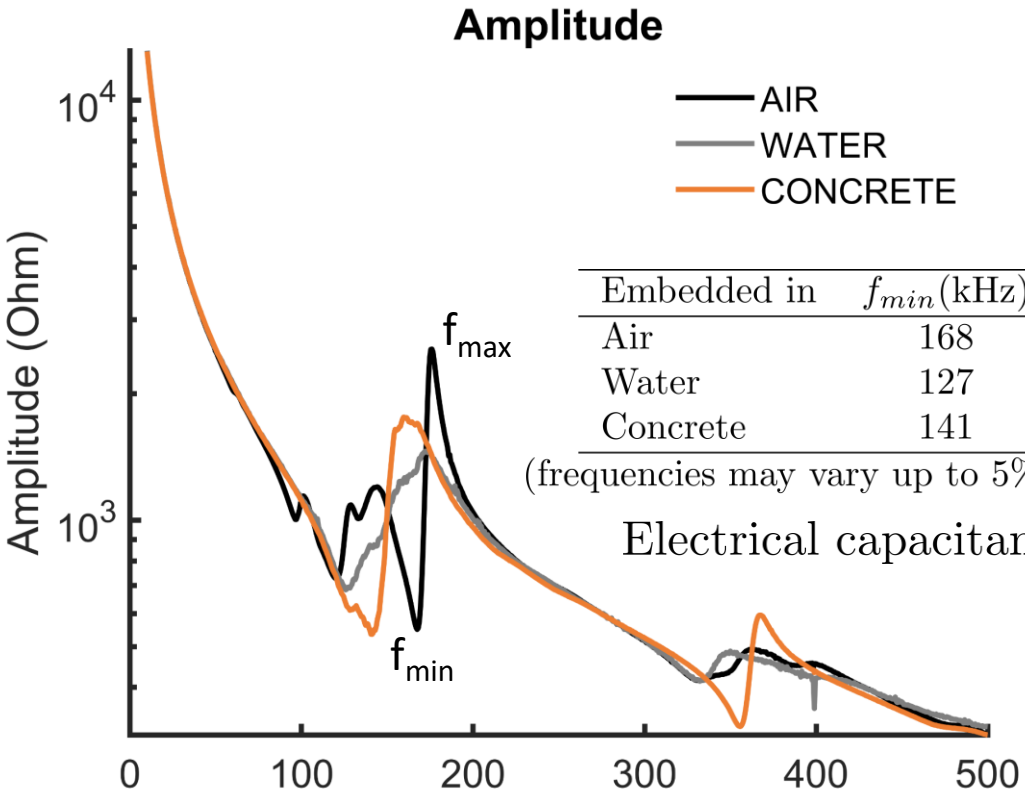
The transducers can replace external transducers in laboratory applications such as measurement of wave velocity in concrete or acoustic emission monitoring. They can be used to monitor continuously the state of concrete in long tests such as freeze-thaw cycling or drying tests, as well as short resistance tests (cylinder compression, bending tests, ...). They have also proven to be effective for on-line monitoring of civil engineering concrete infrastructure to provide real-time data to the company responsible for the maintenance, even in hazardous or inaccessible locations.

General technical information

Transducer Dimensions



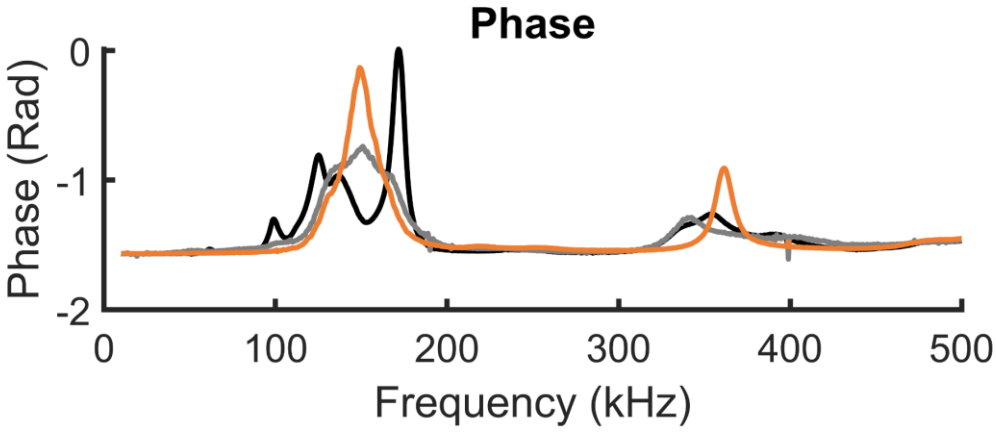
Typical Electrical impedance curve



Embedded in	f_{min}(kHz)	f_{max}(kHz)
Air	168	176
Water	127	177
Concrete	141	162

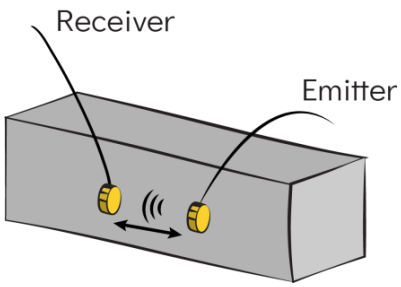
(frequencies may vary up to 5% from typical values)

Electrical capacitance 1.12 nF

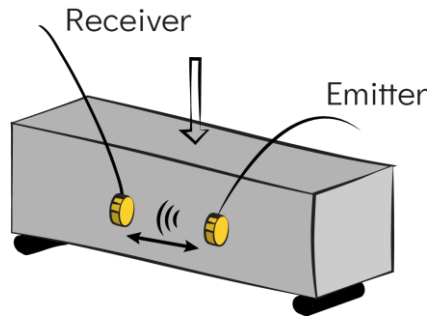


Application examples

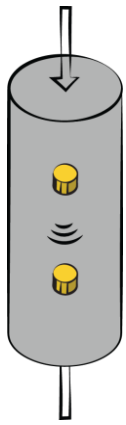
Early-age monitoring of concrete properties



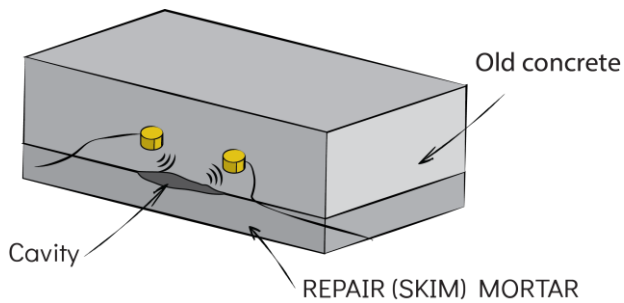
Three-point bending tests



Cylinder compression tests



Monitoring of concrete repair



Main publications

- C. Dumoulin and A. Deraemaeker. All seasons monitoring of concrete repair in an urban tunnel in brussels using embedded ultrasonic transducers with emphasis on robustness to environmental variations. Journal of Civil Structural Health Monitoring, 2021
- A. Deraemaeker and C. Dumoulin. Embedding ultrasonic transducers in concrete: A lifelong monitoring technology. Construction and Building Materials, 194:42–50, 2019
- C. Dumoulin and A. Deraemaeker. Real-time fast ultrasonic monitoring of concrete cracking using embedded piezoelectric transducers. Smart Materials and Structures, 26, 2017

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