Ultrasonic Ceramic Sensors (Ultrasonic Ceramic Transducers)

Type: **U/H/S/Q**

Ultrasonic Ceramic Sensor consisting of a disc type/a bimorph type piezoelectric ceramic vibrator is a sensor for transmitting and receiving ultrasonic wave in the air.

■ Features

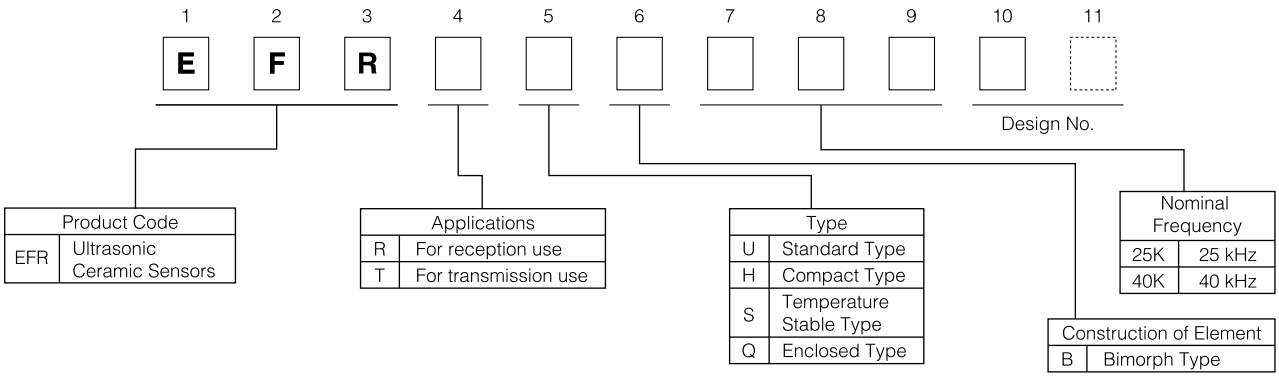
- High output S.P.L.: 112 dB min. (Ex. EFRTUB40K5)
- High sensitivity: –45 dB min. (Ex. EFRRUB40K5)
- Excellent temperature and humidity durability
- Small in size
- Applicable to multi-function remote control system because of its wide bandwidth

■ Recommended Applications

Ultrasonic wave transmitter and receiver for;

- Proximity switch for burglar alarm system, parking meter and automatic door opener
- Remote control equipment for such as air conditioner and garage door opener

■ Explanation of Part Numbers



Design, Specifications are subject to change without notice. Ask factory for technical specifications before purchase and/or use.
Whenever a doubt about safety arises from this product, please inform us immediately for technical consultation without fail.

■ Ratings and Characteristics

Item \ Type / Part No.		Standard Type			
		EFRRUB40K5	EFRTUB40K5	EFRRUB25K5	EFRTUB25K5
Nominal Frequency	(kHz)	40.0	40.0	25.0	25.0
Sensitivity	(dB)*	–45 min.	—	–45 min.	—
Sound Pressure Level	(dB)**	—	112 min.	—	105 min.
Bandwidth	(kHz)	4.0 min.	4.0 min.	2.5 min.	2.5 min.
Application		Receiver	Transmitter	Receiver	Transmitter
Maximum Input Voltage	(Vrms)	—	20	—	20
Operating Temperature Range	(˚C)	–20 to 60			

Item \ Type / Part No.		Compact Type		Temperature Stable Type	
		EFRRHB40K5	EFRTHB40K5	EFRRSB40K5	EFRTSB40K5
Nominal Frequency	(kHz)	40.0	40.0	40.0	40.0
Sensitivity	(dB)*	–47 min.	—	–50 min.	—
Sound Pressure Level	(dB)**	—	110 min.	—	105 min.
Bandwidth	(kHz)	4.0 min.	4.0 min.	4.0 min.	4.0 min.
Application		Receiver	Transmitter	Receiver	Transmitter
Maximum Input Voltage	(Vrms)	—	20	—	20
Operating Temperature Range	(˚C)	–20 to 60		–40 to 100	

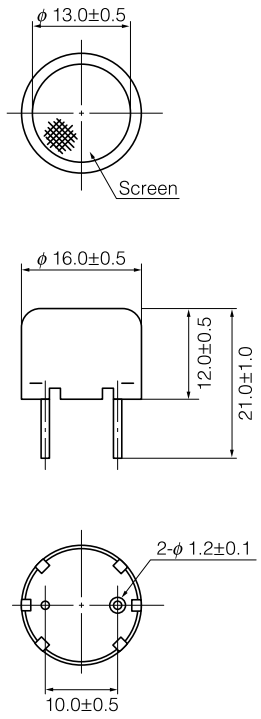
Item \ Type / Part No.		Enclosed Type	
		EFRRQB40K5	EFRTQB40K5
Nominal Frequency	(kHz)	40.0	40.0
Sensitivity	(dB)*	–55 min.	—
Sound Pressure Level	(dB)**	—	105 min.
Bandwidth	(kHz)	1.0 min.	1.0 min.
Application		Receiver	Transmitter
Maximum Input Voltage	(Vrms)	—	20
Operating Temperature Range	(˚C)	–20 to 60	

* 0 dB=1 V/Pa ** 0 dB=2×10^{-5} Pa

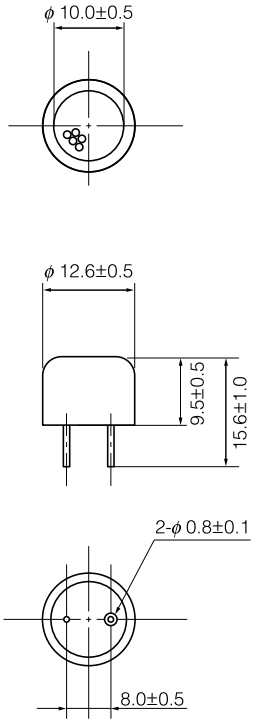
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■ Dimensions in mm (not to scale)

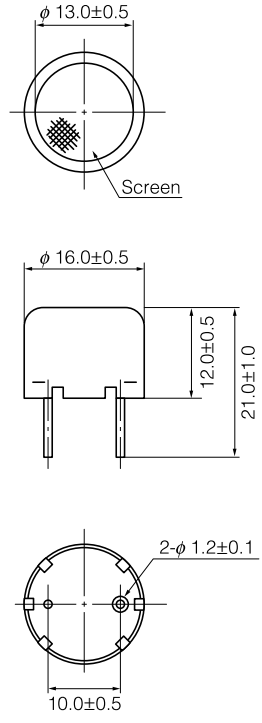
Type U
Standard Type



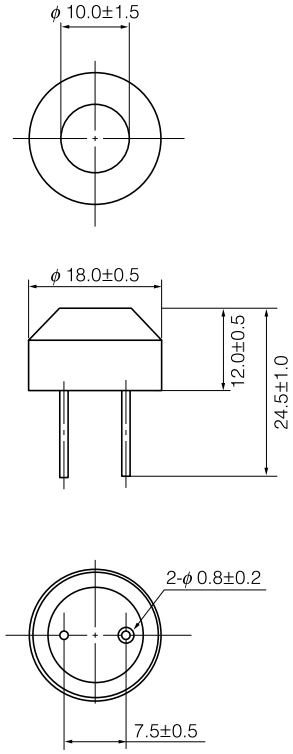
Type H
Compact Type



Type S
TemperatureStable Type

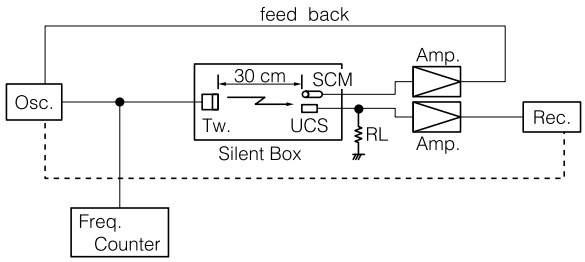


Type Q
Enclosed Type



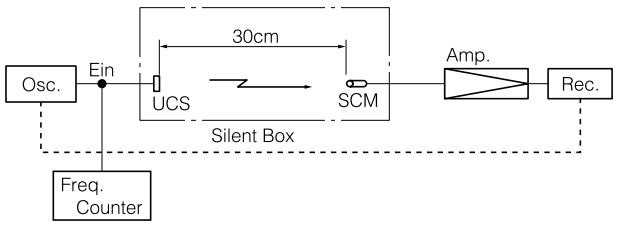
■ Test Circuits Diagram

Test Circuit Diagram for Receiver



RL : 3.9 kΩ
UCS : Ultrasonic Ceramic Sensor
SCM : Standard Condenser Microphone Brüel & Kjær 4135
Amp. : Amplifier Brüel & Kjær 2606
Osc. : Oscillator Brüel & Kjær 1013
Rec. : Recorder Brüel & Kjær 2305
Tw. : Tweeter

Test Circuit Diagram for Transmitter



UCS : Ultrasonic Ceramic Sensor
SCM : Standard Condenser Microphone Brüel & Kjær 4135
Amp. : Amplifier Brüel & Kjær 2606
Osc. : Oscilator Brüel & Kjær 1013
Rec. : Recorder Brüel & Kjær 2305
Ein : 10 Vrms.

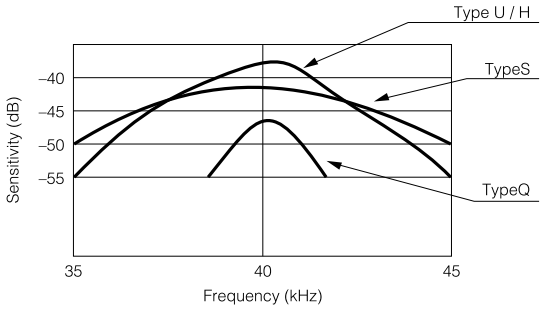
[Sensitivity]
Output voltage of the specimen shall be measured in accordance with the specified Test Circuit and the specified test conditions. The output voltage shall be expressed in decibeles (dB), where 1 V/Pa is 0 dB.

[Sound Pressure Level]
Maximum sound pressure level from the specimen shall be measured in accordance with the specified Test Circuit and the specified test conditions. The output sound pressure shall be expressed in decibeles (dB), where 2×10^{-5}Pa is 0 dB.

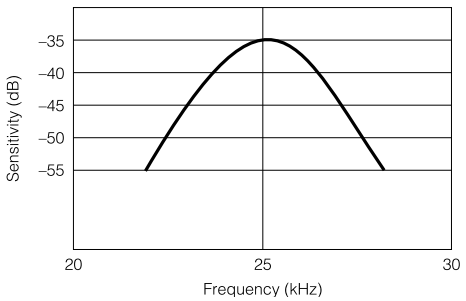
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■ Typical Characteristics

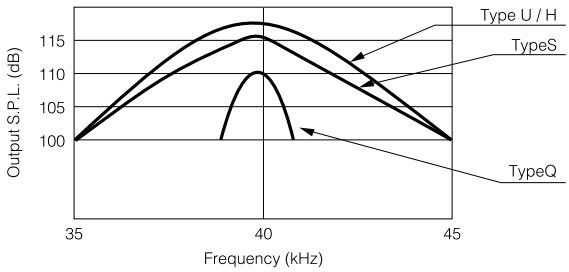
Frequency Characteristics (Sensitivity)



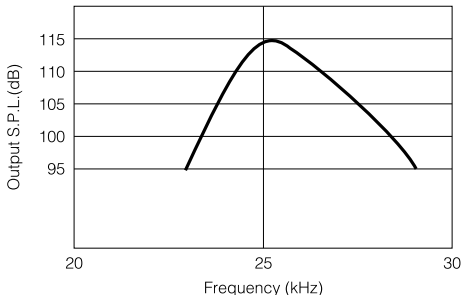
EFRRUB25K



Frequency Characteristics (Sound Pressure Level)

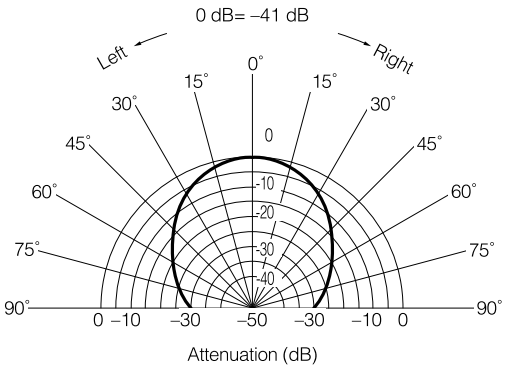


EFRTUB25K

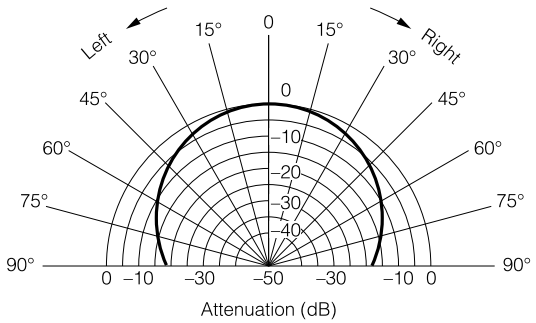


Directivity

Type U/H/S

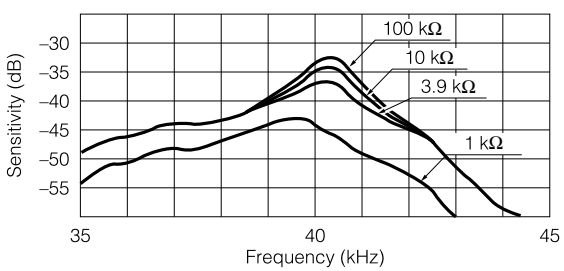


Type Q

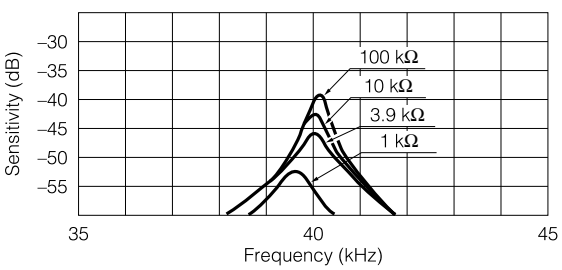


Characteristic Change vs. Load Resistance

Type U/H/S (40 kHz)



Type Q



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Application Notes

Because the Ultrasonic Sensors are designed for use in the air, they can not be used under the water or others liquid.

1. Design Engineering Notes
   1. Application of DC voltage
      DC voltage shall not be applied to the Ultrasonic Sensors because insulation resistance may deteriorate.
   2. Maximum Input Voltage
      The Ultrasonic Sensors shall not be operated beyond the specified "Maximum Input Voltage" in the catalog or the specifications.
   3. Characteristics change owing to load impedance
      Center frequency and sensitivity change in accordance with load impedance.
      Therefore, the load characteristics chart shall be taken into consideration in designing circuit.
   4. In the Design of Transmitting Circuits
      It shall be noted that the impedance of the device is as low as 500 Ω (approximately) at the resonance frequency.

2. Mounting Notes
   1. Installation
      It is recommended to hold the Ultrasonic Sensors by means of rubber* sheets or cushions for absorption of mechanical stresses such as shock and vibration.

      *Except sulfurated rubber
   2. Soldering
      Soldering of the lead terminals shall be done at a position of 2.5 mm or more apart from bottom plain of the devices.
   3. Bending force to the Terminals
      Abnormal bending force shall not be applied to the terminals of the Sensors, otherwise holding parts of the terminals may be easily broken, resulting in failures and damages of the devices.
   4. Directivity
      Please be cafeful enough in deciding facing position of the sensor because of directivity.

3. Storage Notes
   1. Environmental Conditions
      The Ultrasonic Sensors shall not be operated and/or stored under following environmental conditions;
      a) To be exposed directly to water or salt water.
      b) Under conditions of dew formation or frost.
      c) Under conditions of corrosive atomosphere such as hydrogen sulfide, sulfurous acid, chlorine and ammonia.
   2. Long Term Storage
      The Ultrasonic Sensors shall not be stored under severe conditions of high temperature and high humidity. Store them indoors under 40 °C max. and 75 %RH max. Use them within one year and check the solderbility before use.