

1736P1  
3711

# ULTRASONIC SENSOR



## Ultrasonic Sensor MA Series

### Higher Sensitivity and Sound Pressure. Excellent Characteristics against Temperature and Humidity.

This sensor radiates ultrasonic waves and detects echo, having many applications in measuring and detecting objects.

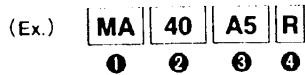
Based on its piezoelectric ceramics technology, Murata has various types of ultrasonic sensors of compact and higher performances.

#### FEATURES

1. Compact and light weight.
2. High sensitivity and sound pressure.
3. Less power consumption.
4. High reliability.

#### PART NUMBERING

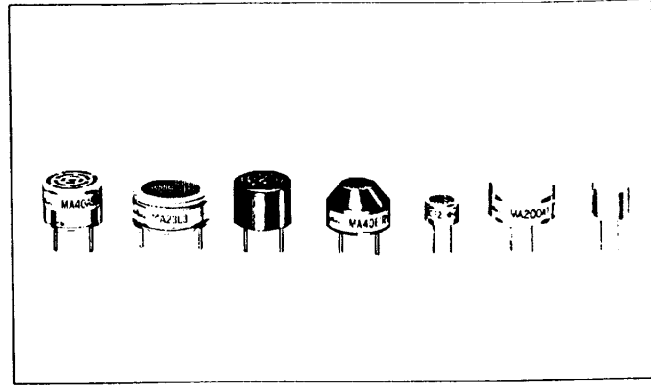
(\*Please specify the part number when ordering.)



- ① Ultrasonic Sensor
- ② Nominal Frequency
- ③ Design Number
- ④ R: Receiver, S: Sounder

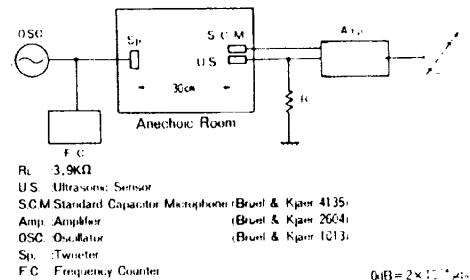
#### CLASSIFICATION

1. General Use Type (Open Structure)  
Using combined vibration mode of bimorph transducer and radial corn, this type realizes high sensitivity and high sound pressure level.  
Applications : Automatic doors, Burglar alarms, Remote control, Range finders.
2. Water Proof Type  
This type has excellent resistance to harsh environmental conditions and can be used outdoors because of its tightly sealing structure.  
Applications : Back sonar of automobiles, Parkingmeters, Water level meters.
3. High Frequency Type  
This type utilizes thickness expansion mode of piezoelectric ceramics and special acoustic matching layer well matched with air to realize high quality sensor.  
For its shorter wavelength it has sharper directivity and is suitable for high resolution measurement.  
Applications : Contactless switch of factory automation, Range finder, Water level meters.

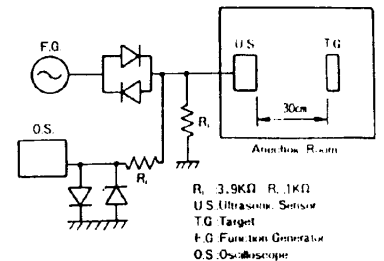
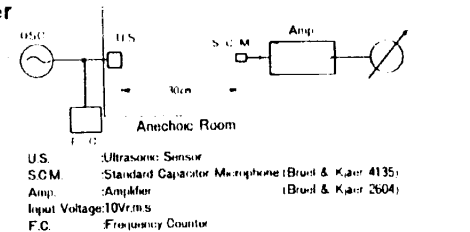


#### TEST CIRCUIT

##### Receiver



##### Transmitter



**Ultrasonic Sensor MA Series**

 MA40E1R 173631  
 MA40E1S 173711

**RATING**
**RECEIVER AND TRANSMITTER (DUAL USE TYPE)**

Item	Part Number	MA23L3	MA40A3 <sup>R/S</sup>	MA40A5 <sup>R/S</sup>	MA40B5 <sup>R/S</sup>	MA40S2 <sup>R/S</sup>	MA40E1 <sup>R/S</sup>
Nominal Frequency (KHz)		23			40		
Sensitivity (dB)		-70min	-68min	-67min	-67min	-74min	-74min
Sound Pressure (dB)		(102)	110min	112min	112min	100min	106min
Directivity (deg)		80°	50°	50°	50°	100°	100°
Capacitance (pF)		2800	1300	2000	2000	1600	2200
Allowable Input Voltage (Vrms)		20	20	20	20	10	10
Operating Temperature Range (°C)		-20~+60	-20~+85	-20~+85	-20~+85	-30~+85	-30~+85
Detectable Range (m)		0.2~6	0.2~6	0.2~6	0.2~6	0.2~4	0.2~3
Resolution (mm)		15			9		
Dimension (mm)		24φ×10.7h		16φ×12h		10φ×6.5h	18φ×12h
Weight (g)		5.7	2.3	2.8	2.3	0.7	4.5
Feature		Broad-Band	General use	General use Broad-Band	Black case	Miniature	Water proof

 ※ Sensitivity: 0dB=1V/μ bar, Sound Pressured at 30cm, 0dB=2×10<sup>-4</sup> μ bar

**COMBINED USE TYPE**

Item	Part Number	MA40B6	MA80A1	MA200A1	MA400A1
Nominal Frequency (KHz)		40	75	200	400
Sensitivity (dB)		-54min (at 30cm)	-47min (at 50cm)	-54min (at 20cm)	-74min (at 10cm)
Directivity (deg)		40°	7°	7°	7°
Capacitance (pF)		1100	940	360	180
Allowable Input Voltage (Vrms)		20	30	20	20
Operating Temperature Range (°C)		-20~+85	-20~+40	-20~+60	-20~+60
Detectable Range (m)		0.2~4	0.5~5	0.2~1	0.06~0.3
Resolution (mm)		9	4	2	1
Dimension (mm)		16φ×12h	47φ×23.5h	19φ×11h	11φ×210.5h
Weight (g)		1.8	93	6.0	2.0
Feature		General use		High resolution	

※ Sensitivity: 0dB=20Vpp

**PRECAUTIONS FOR USE**

1. Pay attention to the mounting position as these sensors have directivity.
2. Do not apply DC-bias for long time.
3. Do not use in water.





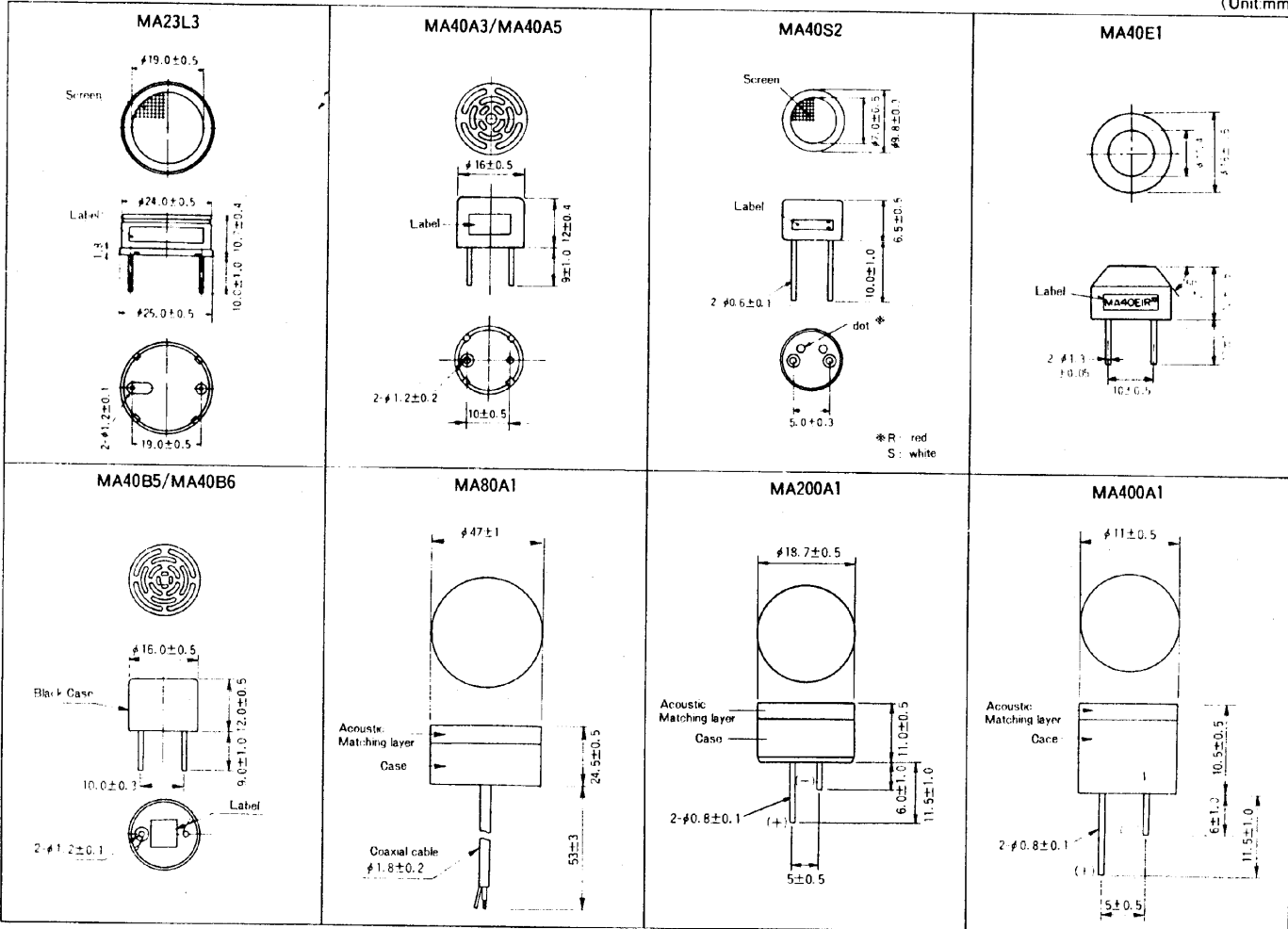
# ULTRASONIC SENSOR

muRata

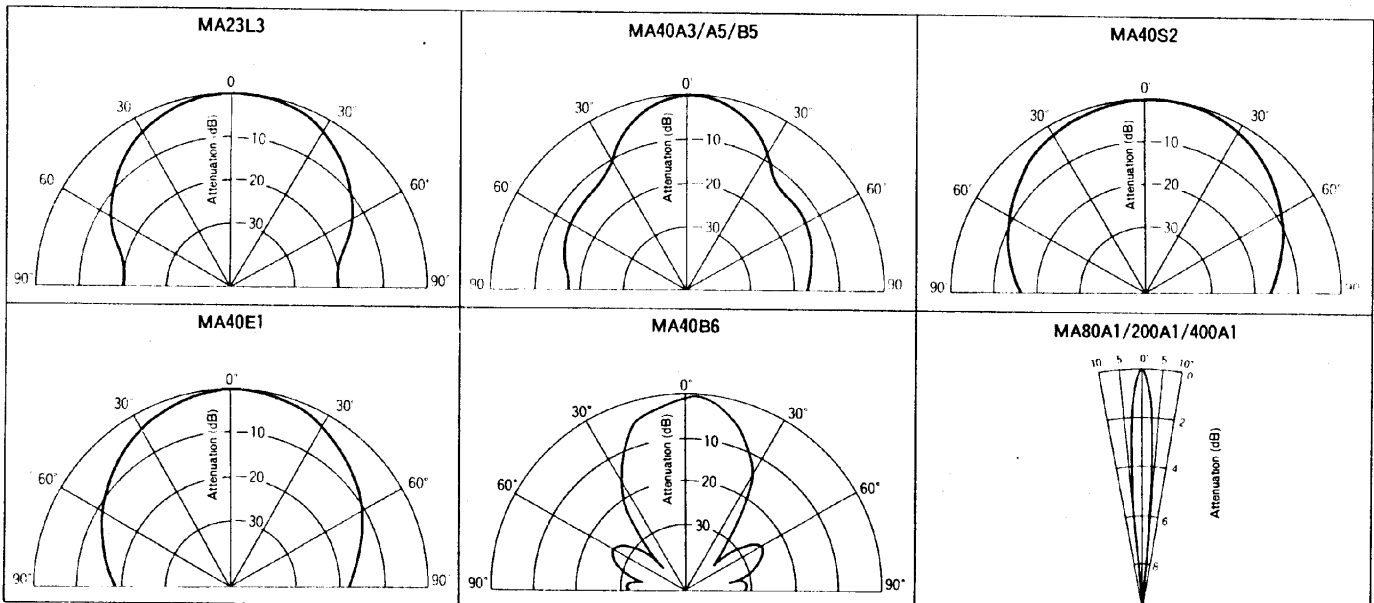
## Ultrasound Sensor MA Series

### DIMENSIONS

(Unit:mm)



### DIRECTIVITY



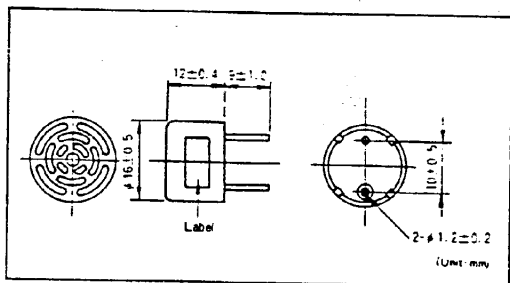
# Piezo-Ultraschallwandler Baureihe 4491

Typen MA 40 A5 R/S, MA 40 E1 R/S

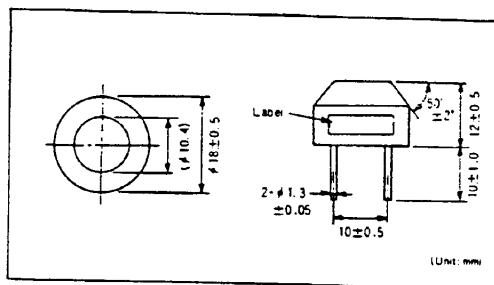
Piezo ultrasonic transducer Series 4491

Types MA 40 A5 R/S, MA 40 E1 R/S

MA 40 A5 S/R



MA 40 E1 S/R



gekapselte Ausführung/sealed type

## Technische Werte Technical data

Sender  
Transmitter

Empfänger  
Receiver

Sender  
Transmitter

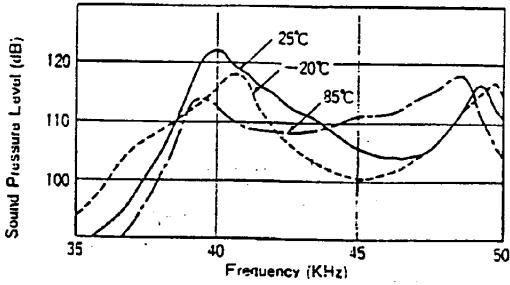
Empfänger  
Receiver

Typ Type	MA 40 A5 S	MA 40 A5 R	MA 40 E1 S	MA 40 E1 R
Nennfrequenz Rated frequency	40 kHz	40 kHz	40 kHz	40 kHz
Schalldruckpegel (40 kHz/10 V <sub>rms</sub> ) Sound pressure level (40 kHz/ $\frac{P_{eff}}{10V_{rms}}$ )	≥ 112 dB	-	≥ 106 dB	-
Empfindlichkeit (40 kHz) Sensitivity (40 kHz)	-	≥ -67 dB	-	≥ -74 dB
Bandbreite Band width	≥ 7 kHz bei/at 90 dB	≥ 6 kHz bei/at -74 dB	≥ 1,5 kHz bei/at 100 dB	≥ 2 kHz bei/at -80 dB
Kapazität (1 kHz) Capacitance (1 kHz)	2000 pF	2000 pF	2200 pF	2200 pF
Isolationswiderstand Insulation resistance	≥ 100 MΩ	≥ 100 MΩ	≥ 100 MΩ	≥ 100 MΩ
Temperaturcharakteristik Temperature characteristics	Schalldruck bzw. Empfindlichkeit innerhalb ± 10 dB bei sound pressure level or sensitivity within ± 10 dB at			
	-20...+60 °C	-20...+60 °C	-30...+80 °C	-30...+80 °C

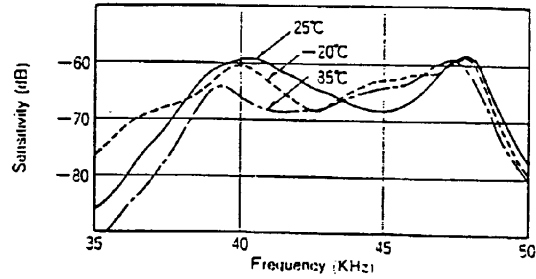
**Typische Eigenschaften**  
**Typical characteristics**

Schalldruckpegel bzw. Empfindlichkeit in Abhängigkeit von der Frequenz  
 Sound pressure level resp. sensitivity versus frequency

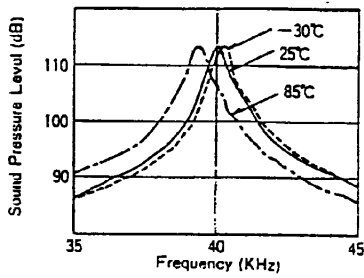
MA 40 A5 S



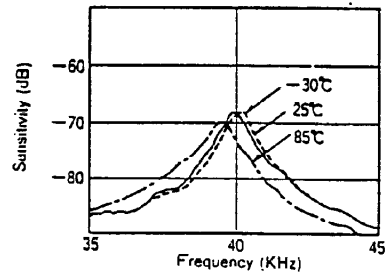
MA 40 A5 R



MA 40 E1 S

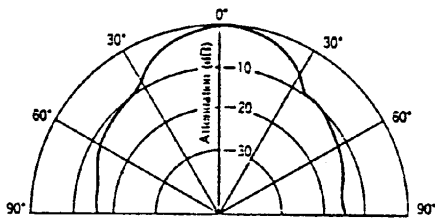


MA 40 E1 R

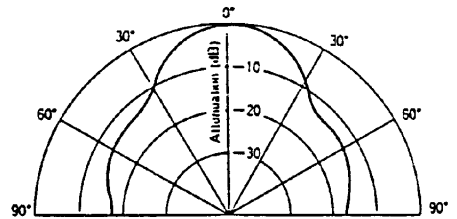


Strahlungs- bzw. Empfangscharakteristik  
 Radiation resp. pick-up characteristics

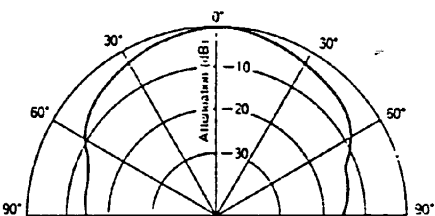
MA 40 A5 S



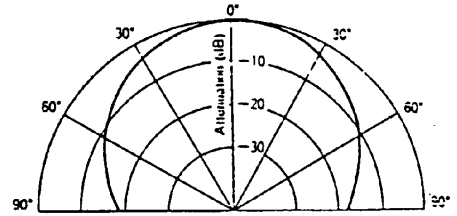
MA 40 A5 R



MA 40 E1 S



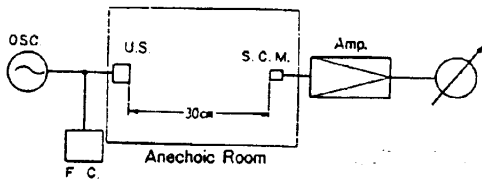
MA 40 E1 R



## Meßaufbau

### Measuring circuit diagrams

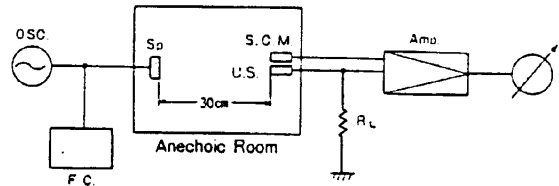
Sender  
transmitter



$$0\text{dB} = 1\text{V}/\mu\text{bar}$$

Meßspannung/measuring voltage  $10\text{V}_{\text{eff/rms}}$

Empfänger  
receiver



$$0\text{dB} = 2 \times 10^{-6} \mu\text{bar}$$

A Schalltoter Raum/anechoic chamber

Amp. Verstärker/Amplifier Bruel & Kjaer 2604

F.C. Frequenzzähler/frequency counter

OSC. Oszillator/oscillator Bruel & Kjaer 1013

S.C.M. Standard-Meßmikrofon/standard capacitors microphone Bruel & Kjar 4135

U.S. Prüfobjekt/test sample

Sp. Ultraschallerzeuger/ultrasonic tweeter

$R_L$  Widerstand/resistance  $3,9\text{k}\Omega$

Mit den Angaben dieses Datenblattes werden die Produkte spezifiziert, nicht Eigenschaften zugesichert.

Liefermöglichkeiten und technische Änderungen vorbehalten.

The information given in this data sheet describes the products and shall not be considered as assured characteristics.

We reserve the rights for delivery availability and technical changes.

## **Metz- und Prüfbedingungen**

### Bezugstemperatur

Die technischen Werte sind auf eine Umgebungstemperatur von 25 °C bezogen

### Standard-Prüfbedingungen

Sofern nichts anderes angegeben, gilt für die Prüfungen:

Temperatur: 20 bis 25 °C

Feuchte: 45 bis 60% r. F.

## **Umwelprüfungen für MA 40 A5 S/R**

### Feuchteprüfung

Temperatur: 40 °C ± 2 °C

Feuchte: 90 bis 95% r. F.

Prüfdauer: 100 h

### Schockverhalten

Beschleunigung: 980 m/s<sup>2</sup>

Impulsdauer: 6 ms

3 Richtungen, 3 Schocks je Richtung

### Schwingungsprüfung

Frequenzbereich: 10 bis 55 Hz

Periode: 1 min

Amplitude: 1,5 mm (Spitze-Spitze)

3 Richtungen, 2 h je Richtungen

### Prüfkriterien

Schalldruck bzw. Empfindlichkeit:

≤ 3 dB Änderung gegenüber dem Anfangswert vor der jeweiligen Prüfung

## **Umwelprüfungen für MA 40 E1 S/R**

### Feuchteprüfung

Temperatur: 80 °C ± 2 °C

Feuchte: 90 bis 95% r. F.

Prüfdauer: 500 h

### Fallprüfung

10 mal auf Betonboden aus 1 m Höhe

### Prüfkriterien

Prüfkriterien in 24 h nach der Prüfung

Schalldruck, bzw. Empfindlichkeit:

≤ 2 dB Änderung gegenüber dem Anfangswert vor der jeweiligen Prüfung

Mittenfrequenz:

≤ 0,8 kHz Änderung gegenüber dem Anfangswert vor der jeweiligen Prüfung

## **Measuring and test conditions**

### Reference temperature

Technical data are given for an ambient temperature of 25 °C

### Standard test conditions

For tests, unless otherwise stated, the following conditions are valid:

temperature: 20 to 25 °C

humidity: 45 to 60% r. h.

## **Environmental tests for MA 40 A5 S/R**

### Humidity test

temperature: 40 °C ± 2 °C

humidity: 90 to 95% r. h.

duration: 100 h

### Shock test

acceleration: 980 m/s<sup>2</sup>

duration of the pulse: 6 ms

3 directions, 3 shocks per direction

### Vibration test

frequency range: 10 to 55 Hz

sweep period: 1 min

amplitude: 1,5 mm (peak to peak)

3 directions, 2 h per direction

### Test criteria

Sound pressure level or sensitivity:

≤ 3 dB variation compared with the initial value before the respective test

## **Environmental tests for MA 40 E1 S/R**

### Humidity test

temperature: 80 °C ± 2 °C

humidity: 90 to 95% r. h.

duration: 500 h

### Drop test

10 times on concrete floor from 1 m height

### Test criteria

Test criteria in 24 h after test

Sound pressure level or sensitivity:

≤ 2 dB variation compared with the initial value before the respective test

centre frequency:

≤ 0,8 kHz variation compared with the initial value before the respective test