RION

# Condenser Microphones

# Condenser Microphones UC Series

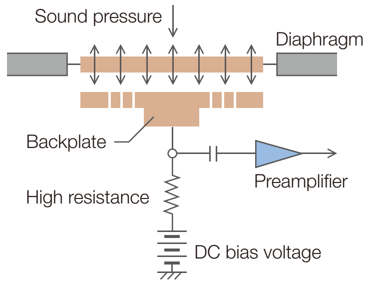
## Sound field and sound pressure models

In ordinary measurements, the placement of the microphone has an impact on sound pressure at the measurement point at high frequencies. Sound field microphones are designed to flatten frequency characteristics by taking that impact into account in advance. They are used for ordinary measurements.
In contrast, sound pressure microphones are designed to have flat frequency response for the sound pressure applied to the diaphragm without taking the impact on the surrounding sound field into account. They are used for measurements in reverberant room or using couplers.


## Action principle of condenser microphones

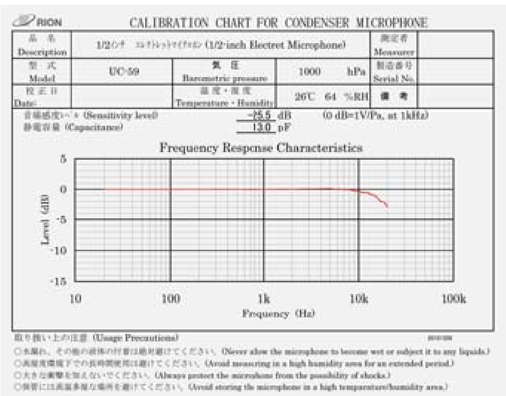
Ordinary condenser microphones are electrostatic-type condenser microphones consisting of a diaphragm that vibrates in response to sound pressure and a fixed electrode (backplate) positioned parallel to the diaphragm at a distance of a few dozen microns as indicated in Fig. 1. Since condenser microphones detect changes in electrostatic capacitance between the diaphragm and backplate caused by sound pressure, they are used with the application of DC bias voltage (generally 200 V).Microphones that have an electrically charged membrane on the surface of the backplate instead of applying DC bias voltage are known as electret microphones, which are widely used in sound measurements and other applications.

Fig. 1 Action principle of condenser microphones

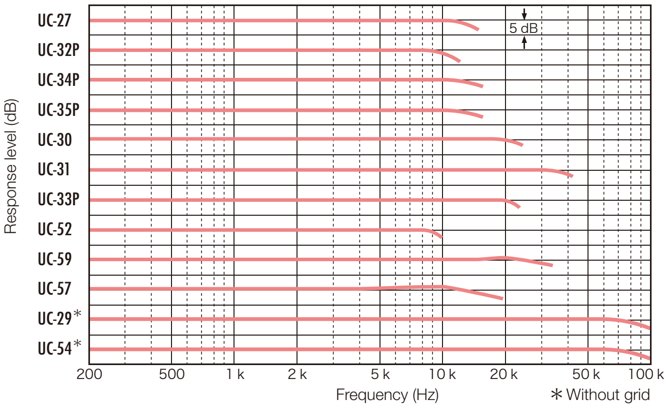



## Calibration charts including frequency response curves are appended to individual microphones

UC-59 microphone calibration chart (example)




Microphone frequency response




Microphones

| Model | UC-27 | UC-32P | UC-34P | UC-35P | UC-30 | UC-31 | UC-33P | UC-52 | UC-59 | UC-57 | UC-29 | UC-54 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Suitable preamplifier | NH-06A | NH-06A | NH-34 set | NH-35 set | NH-04A/05A/12A | NH-04A/05A/12A | NH-04A/05A/12A | NH-17/17A/22A | NH-17/17A/22A | NH-17/17A/22A | NH-05A (UA-12 required) | NH-17/17A/22A (UA-12 required) |
| Nominal diameter | 1 inch | | | | 1/2 inch | | | | | | 1/4 inch | |
| Frequency response | Field | Pressure | Field | Field | Field | Field | Pressure | Field | Field | Field | Field | Field |
| Frequency range (Hz) | 5 to 12 500 | 5 to 9 000 | 10 to 12 500 | 10 to 12 500 | 10 to 20 000 | 10 to 35 000 | 10 to 20 000 | 20 to 8 000 | 10 to 20 000 | 10 to 16 000 | 20 to 100 000[*2] | 20 to 100 000[*2] |
| Bias voltage (V) | 200 | 200 | 200 | 0 | 200 | 200 | 200 | 0 | 0 | 0 | 200 | 0 |
| Sensitivity level (dB re 1 V/Pa) [*1] | −26.5 | −27 | −21/−1[*5] | 0 | −25.5 | −37 | −38 | −33 | −27 | −22 | −47 | −48 |
| Capacitance (pF) | 54 | 56 | — | — | 17 | 20 | 20 | 19 | 13 | 14 | 6 | 4 |
| Maximum input sound pressure level (dB) (Linearity error ±0.3 dB) | 152 | 154 | — | 96 | 144 | 160[*4] | 160 | 150 | 148 | 132[*4] | 164[*4] | 164 |
| A-weighted Inherent noise (dB) | 12 | 13 | 2 | 4 | 20 | 26 | 28 | 24 | 18 | 13 | 42 | 45 |
| Temperature coefficient (dB/°C) | −0.005 | −0.008 | — | −0.008 | −0.007 | −0.007 | −0.009 | −0.008 | <±0.35 dB (at 1 kHz)[*3] | <±0.45 dB (at 250 Hz)[*3] | −0.01 | <±0.7 dB (at 250 Hz)[*3] |
| Diaphragm | Titanium alloy | | | | Titanium alloy | | | | | | Titanium | |
| Dimensions (mm) | 23.8 (dia)x21.0 | 23.8 (dia)x21.0 | 23.8 (dia)x131 | 23.8 (dia)x132.7 | 13.2 (dia)x15.0 | 13.2 (dia)x13.2 | 13.2 (dia)x13.2 | 13.2 (dia)x12.0 | 13.2 (dia)x14.3 | 13.2 (dia)x13.5 | 7.0 (dia)x10.0 | 7.0 (dia)x10.0 |

*1: 1 kHz Representative value　*2: UC-29/54 frequency range is the one (measured on condition) that the grid at its top is taken off.　*3: -10 ℃ to +50 ℃ (+23 ℃ is reference point)
*4: Distortion rate 3 %　*5: Depend on connected instrument


# Preamplifiers NH Series

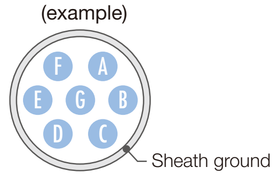
## Preamplifier Overview

A preamplifier with high input impedance and low output impedance is required in order to faithfully transfer the voltage converted by the microphone to the subsequent amplifier.
In the preamplifier, the electrical circuit and 7-pin connector shown in Fig. 2 have a unified structure and various models are available to ensure the optimal combination for the type of microphone and diameter.
A conversion adapter is used when using a microphone with a different diameter.

## Preamplifier characteristics and usage

Preamplifiers are connected to microphones with a high input impedance and generate output signals with a low impedance. In measurements using a long extension cable, the maximum output voltage, which is affected by the length of the cable, changes, thereby changing the sound pressure level by frequency that can be measured. This is due to the change in electrostatic capacitance between the signal line and shield as a result of the cable length, as illustrated in Fig. 3.
For example, the extension cable can be no longer than about 50 m when measuring sound pressure of 110 dB to 10 kHz using a microphone with a sensitivity level of –26 dB (model UC-27). Fig. 4 indicates the relationship between the output impedance of the preamplifier and the maximum measurement frequency determined by electrostatic capacitance based on the length of the extension cable. Since the output impedance of the preamplifier is 100 Ω or less, frequency response can readily be handled to 15 kHz even if using an extension cable with a length of 500 m.

Fig. 2 Preamplifier connector (example)




**A** : Preamplifier power supply +V
**B** : Ground (internal shield)
**C** : Preamplifier output
**D** : Preamplifier power supply –V
**E** : Bias voltage 30 V DC
**F** : Bias voltage 60 V DC
**G** : Bias voltage 200 V DC

Fig. 3 Relationship of measurement frequency and sound pressure level to EC-04 series cable capacitance (cable length)

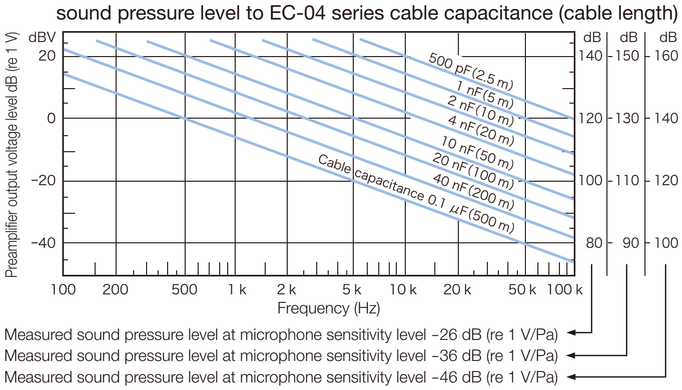
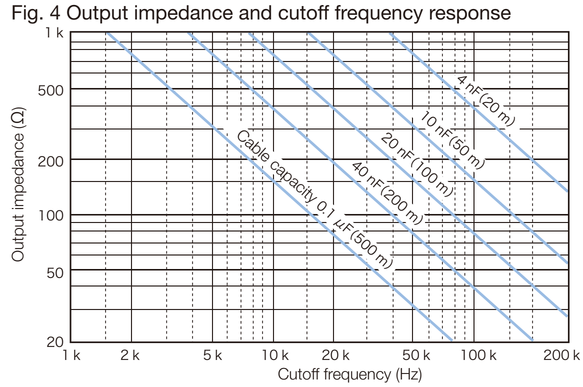



Fig. 4 Output impedance and cutoff frequency response




### Microphone with Preamplifiers TEDS compliant

| Model | UC-52T | UC-57T | UC-59T |
|---|---|---|---|
| Microphones | UC-52 | UC-57 | UC-59 |
| Preamplifier | NH-22AT | NH-22AT | NH-22AT |
| Nominal diameter | 1/2 inch | | |
| Frequency response | Field | Field | Field |
| Frequency range (Hz) | 20 to 8 000 | 10 to 16 000 | 10 to 20 000 |
| Constant currnent drive | 2 mA to 4 mA | 2 mA to 4 mA | 2 mA to 4 mA |
| A-weighted Inherent noise (dB) | 24 | 13 | 16.6 |
| Dimensions (mm) | ϕ13.2×97 | ϕ13.2×98.5 | ϕ13.2×99.4 |
| Cable type | EC-90 series (BNC) | EC-90 series (BNC) | EC-90 series (BNC) |

### Preamplifiers

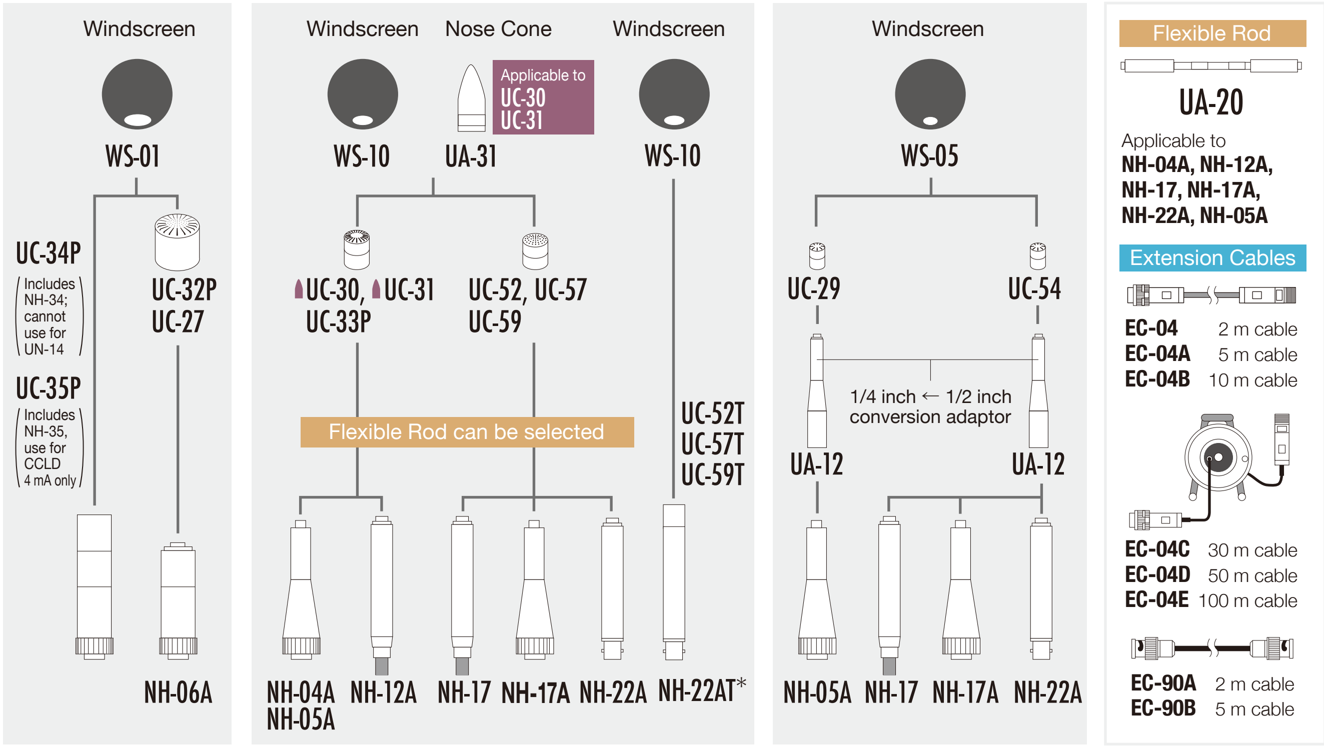
| Model | NH-06A | NH-04A | NH-12A | NH-17 | NH-17A | NH-22A | NH-05A |
|---|---|---|---|---|---|---|---|
| Suitable microphones | UC-27/32P | UC-30/31/33P | UC-30/31/33P | UC-52/54*1/ 57/59 | UC-52/54*1/ 57/59 | UC-52/54*1/57/59 (constant currnent drive) 2 mA to 4 mA | UC-29*1 UC-30/31/33P |
| Nominal diameter | 1 inch | 1/2 inch, 1/4 inch*1 | | | | | 1/2 inch, 1/4 inch*1 |
| Input impedance (GΩ) | 3 | 3 | 3 | 3 | 3 | 5 | 10 |
| Input capacitance (pF) | 0.3 | 0.25 | 0.25 | 0.8 | 0.8 | 0.8 | 0.2 |
| Frequency range (Hz) | 5 to 100 000 | 10 to 100 000 | 10 to 100 000 | 10 to 100 000 | 10 to 100 000 | 10 to 100 000 | 10 to 100 000 |
| Bias voltage (V) | 200 | 200 | 200 | 0 | 0 | 0 | 200 |
| Gain (dB) | −0.1 (54 pF) (UC-27) | −0.2 (17 pF) (UC-30) | −0.2 (17 pF) (UC-30) | −0.5 (13 pF) (UC-59) | −0.5 (13 pF) (UC-59) | −0.5 (13 pF) (UC-59) | −0.5 (6 pF) (UC-29) (UA-12 required) |
| A-weighted Inherent noise (dB) | 12 (UC-27) | 19 (UC-30) | 19 (UC-30) | 18 (UC-59) | 18 (UC-59) | 16.6 (UC-59) | 42 (UC-29) |
| Output impedance (Ω) | ≤ 100 | ≤ 100 | ≤ 100 | ≤ 300 | ≤ 300 | Approx. 120 | ≤ 100 |
| Cable type | EC-04 series (7p) | EC-04 series (7p) | 1.5 m integrated (7p) | 5 m integrated (7p) | EC-04 series (7p) | EC-90 series (BNC) | EC-04 series (7p) |

*1: UA-12 required

**TEDS** TEDS is a format to describe tranceducer information regulated by IEEE 1451.
Sensors will be calibrated automatically when connected to TEDS applicable instruments as it has the following recorded parameters inside

**TEDS Parameters** Manufacturer ID, Model Number, Serial Number, Sensitivity, Calibration Date, etc.

## Combinations centered in condenser microphones




∗TEDS is applicable only for UN-14 and SA-02.

### Extension cables

| Type | Model | Remarks |
|---|---|---|
| 7P microphone extension cable | EC-04 | 2 m |
| | EC-04A | 5 m |
| | EC-04B | 10 m |
| 7P microphone extension Cable (with reel) | EC-04C | 30 m (with EC-04S) |
| | EC-04D | 50 m (with EC-04S) |
| | EC-04E | 100 m (with EC-04S) |
| 7p relay cable | EC-04S | 5 m (for sound level meter and relay connection) |
| BNC-BNC coaxial cable | EC-90A | 2 m |
| | EC-90B | 5 m |

### Microphone related accessories

| Type | Model | Remarks |
|---|---|---|
| 14 inch – 1/2 inch conversion adapter | UA-12 | |
| Flexible Rod (1/2 inch) | UA-20 | |
| 1/2 inch Nose Cone | UA-31 | |
| Microphone holder | EC03001 | For use with 7p preamplifier, EC-04 |
| 1/2 inch microphone holder | UA-90 | For use with 6p preamplifier, EC-15, NH-22A |

### Windscreens

| Type | Model | Remarks |
|---|---|---|
| Windscreen (1 inch) | WS-01 | |
| Windscreen (1/2 inch) | WS-02 | NA-27/27A/28 |
| | WS-10 | NL-42/52/62/20/21/31/22/32 |
| Windscreen (1/4 inch) | WS-05 | UC-29/54 |
| All-weather windscreen | WS-15 | Top part |
| All-weather windscreen, mounting adapter | WS15006 | NL-42/52/62/20/21/31/22/32 |
| Rain-protection windscreen | WS-16 | NL-42/52/62 |

### Sound level meter tripods

| Type | Model | Remarks |
|---|---|---|
| Compact tripod | 5SLIK | Minimum level: Approx. 400 mm, Maximum level: Approx. 1 150 mm |
| Sound level meter tripod | ST-80 | Minimum level: Approx. 570 mm, Maximum level: Approx. 1 460 mm |
| All-weather windscreen tripod | ST-81 | Minimum level: Approx. 1 350 mm, Maximum level: Approx. 2 150 mm |

### Pistonphone and Sound calibrator

| Type | Model | Remarks |
|---|---|---|
| Pistonphone | NC-72A | IEC 60942 : 2003 class LS/C, class1/C, 114 dB, 250 Hz |
| Sound Calibrator | NC-75 | IEC 60942 : 2003 class 1, 94 dB, 1 000 Hz |

JCSS 0197

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∗ Specifications subject to change without notice.

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