RION

Condenser Microphones

Condenser Microphones UC Series

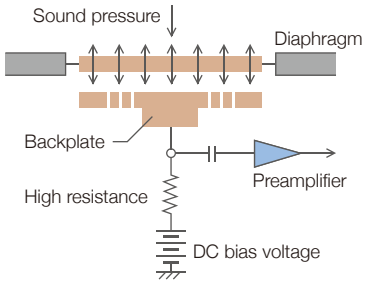
Sound field and sound pressure models

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

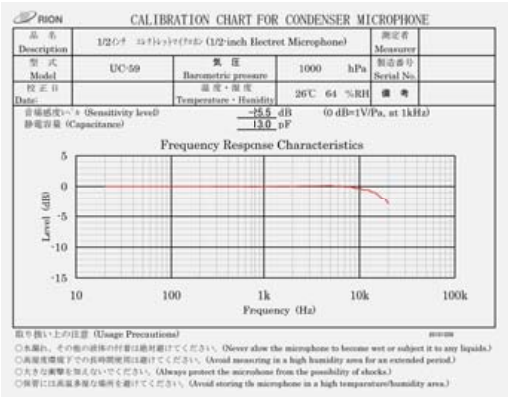
Ordinary condenser microphones are electrostatic-type condenser microphones consisting of a diaphragm that vibrates in response to sound pressure and a fixed electrode (backplate) positioned parallel to the diaphragm at a distance of a few dozen microns as indicated in Fig. 1. Since condenser microphones 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

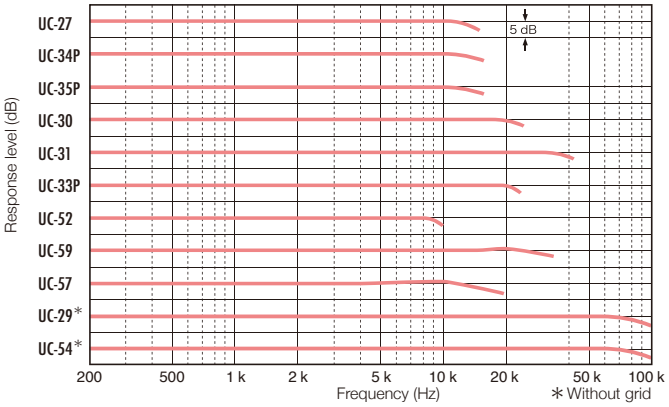


Calibration charts including frequency response curves are appended to individual microphones

UC-59 microphone calibration chart (example)



Microphone frequency response



Microphones

Model	UC-27	UC-34P	UC-35P CE	UC-30 CE	UC-31 CE	UC-33P	UC-52 CE	UC-59 CE	UC-57 CE	UC-29 CE	UC-54 CE
Suitable preamplifier	NH-06B	NH-34 set	NH-35 set	NH-04B/ 05B/12A	NH-04B/ 05B/12A	NH-04B/ 05B/12A	NH-17/ 17A/22A	NH-17/ 17A/22A	NH-17/ 17A/22A	NH-05B (UA-12 required)	NH-17/17A/22A (UA-12 required)
Nominal diameter	1 inch			1/2 inch						1/4 inch	
Frequency response	Field	Field	Field	Field	Field	Pressure	Field	Field	Field	Field	Field
Frequency range (Hz)	5 to 12 500	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	0	200	200	200	0	0	0	200	0
Sensitivity level (dB re 1 V/Pa) *1	−26.5	−21/−1*5	0	−25.5	−37	−38	−33	−27	−22	−47	−48
Capacitance (pF)	54	—	—	17	20	20	19	13	14	6	4
Maximum input sound pressure level (dB) (Linearity error ±0.3 dB)	152	—	96	144	160*4	160	150	148	132*4	164*4	164
A-weighted Inherent noise (dB)	12	2	4	20	26	28	24	18	13	42	45
Temperature coefficient (dB/°C)	−0.005	—	—	−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)×21.0	23.8 (dia)×131	23.8 (dia)×132.7	13.2 (dia)×15.0	13.2 (dia)×13.2	13.2 (dia)×13.0	13.2 (dia)×12.0	13.2 (dia)×14.3	13.2 (dia)×13.5	7.0 (dia)×10.0	7.0 (dia)×10.0

∗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

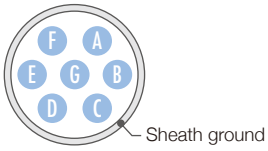
Preamplifier Overview

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)

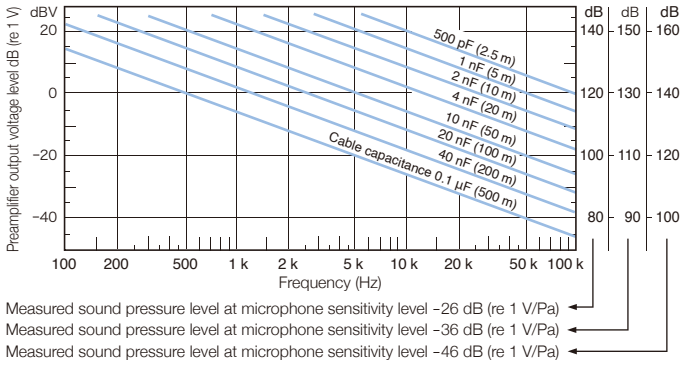
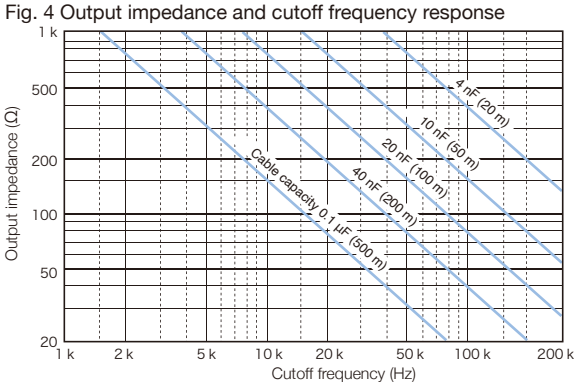


Fig. 4 Output impedance and cutoff frequency response



Microphone with Preamplifiers TEDS compliant

Model	UC-59T CE
Microphones	UC-59
Preamplifier	NH-22AT
Nominal diameter	1/2 inch
Frequency response	Field
Frequency range (Hz)	10 to 20 000
Constant currnent drive	2 mA to 4 mA
A-weighted Inherent noise (dB)	18
Dimensions (mm)	ϕ13.2×99.4
Cable type	EC-90 series (BNC)

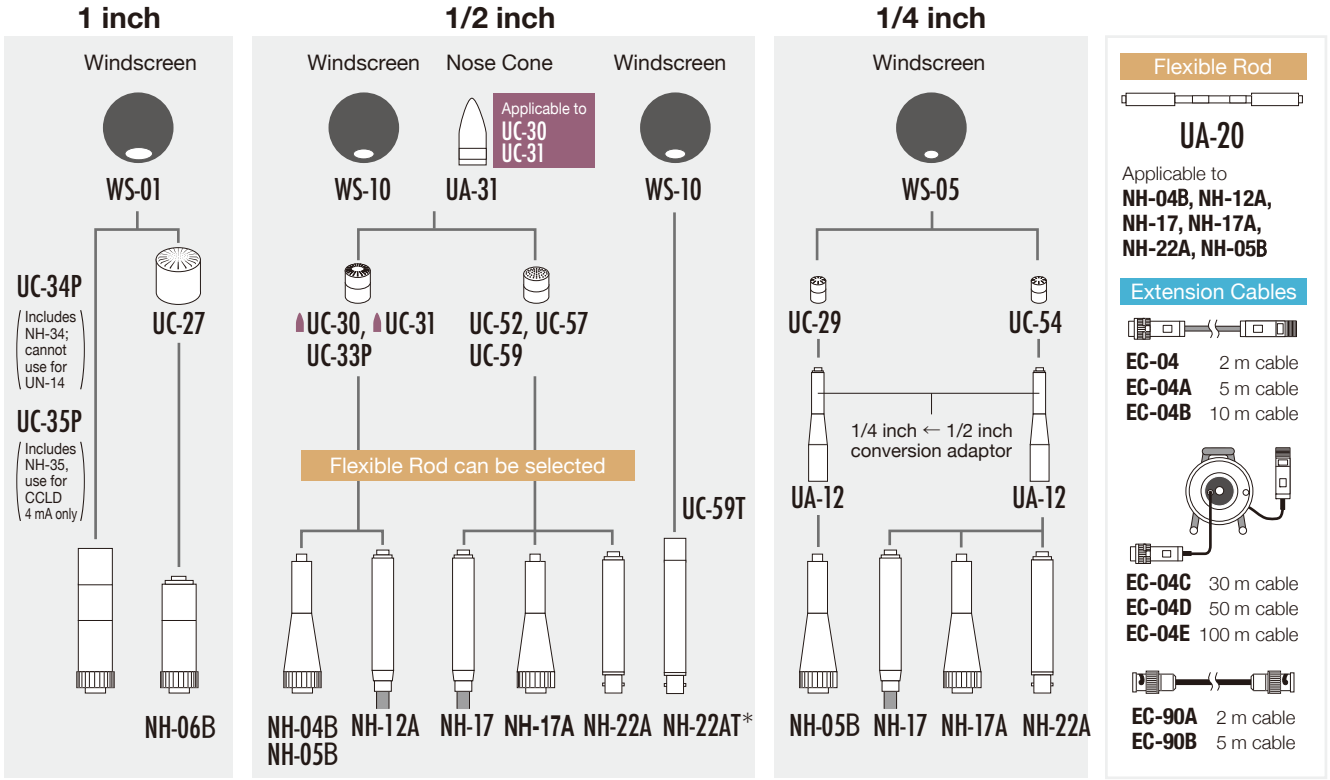
Preamplifiers

Model	NH-06B	NH-04B	NH-12A	NH-17	NH-17A	NH-22A CE	NH-05B
Suitable microphones	UC-27	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	6	10
Input capacitance (pF)	0.3	0.25	0.25	0.8	0.8	0.7	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 (6pF) (UC-29*1)
A-weighted Inherent noise (dB)	12 (UC-27)	20 (UC-30)	20 (UC-30)	18 (UC-59)	18 (UC-59)	18 (UC-59)	42 (UC-29)
Output impedance (Ω)	≤ 100	≤ 100	≤ 100	≤ 300	≤ 300	Approx. 30	≤ 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)

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.

*1: UA-12 required

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

Windscreens

Type	Model	Remarks
Windscreen (1 inch)	WS-01	NA-18/18A
Windscreen (1/2 inch)	WS-02	NA-27/27A/28
	WS-10	NL-43/53/63/42A/52A/62A/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-43/53/63/42A/52A/62A/42/52/62/ 20/21/31/22/32
Rain-protection windscreen	WS-16	NL-43/53/63/42A/52A/62A/42/52/62

Microphone related accessories

Type	Model	Remarks
1/4 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

Sound level meter tripods

Type	Model	Remarks
Compact tripod	5SLIK	Minimum level: Approx. 405 mm, Maximum level: Approx. 1 220 mm
Sound level meter tripod	ST-80	Minimum level: Approx. 570 mm, Maximum level: Approx. 1 460 mm
All-weather windscreen tripod	ST-91	Minimum level: Approx. 1 160 mm, Maximum level: Approx. 1 820 mm

Pistonphone and Sound calibrator

Type	Model	Remarks
Pistonphone	NC-72B	IEC 60942 : 2017 class LS/M, class1/M, 114 dB, 250 Hz
Sound Calibrator	NC-75	IEC 60942 : 2017 class 1, 94 dB, 1 000 Hz

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