

# PRODUCT DATA

## Sound Intensity Microphone Pair — Type 4178

### USES

- Measurement of sound intensity using two-microphone technique, in accordance with IEC 61043 Class 1
- Sound power measurements in accordance with ISO 9614–1, ISO 9614–2, ECMA 160 and ANSIS12.12, using Sound Intensity Probes
- Measurement of particle velocity of sound sources

### FEATURES

- Broadband matching of phase responses
- Phase calibrated in 1/3-octave frequency bands from 100 Hz – 20 kHz

### Description

Type 4178 consists of a pair of selected Type 4939 1/4" microphones, whose phase responses are matched between 100 Hz and 20 kHz.

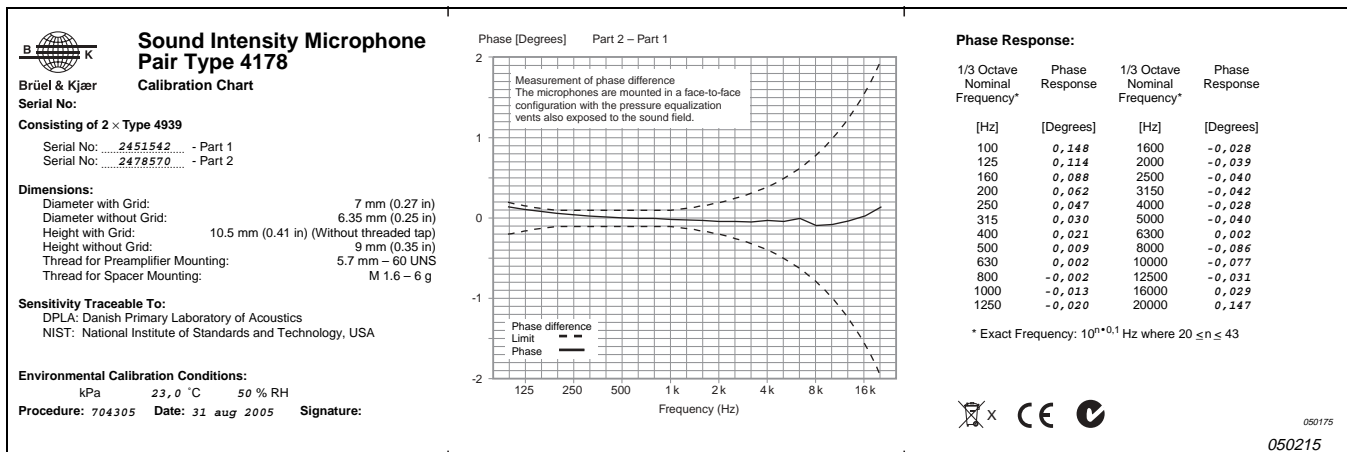
The Type 4939 microphones are specially designed for high level and high frequency measurements. By using stainless steel diaphragm and protection grid, the microphone is optimised to withstand rough environments and is capable of working at high temperatures – up to 150°C (302°F). The microphones are mainly used in Sound Intensity Probes to measure sound intensity and can also be used for particle velocity measurements.



Other uses include measuring the volume velocity of a sound source, using, for example, Brüel & Kjær's Volume Velocity Adaptor Type 4299 fitted to the OmniSource™ Omnidirectional Sound Source Type 4295.

Type 4178 is supplied with 6 mm and 12 mm spacers, along with calibration charts giving the individually measured free-field frequency response for each microphone and a Phase Response Comparison Calibration (100 Hz – 20 kHz) see Fig. 1.

Fig. 1 Calibration chart for Type 4178



**Fig. 2** Sound Intensity Calibrator Type 3541 for pressure, intensity and velocity calibration of sound intensity measuring systems



## Calibration

Phase calibration of 1/4" microphone pair Type 4178 is done at Brüel & Kjær by subjecting the two microphones to the same sound signal in a pressure coupler. This individual phase calibration can be used to derive the Pressure-Residual Intensity Index for the microphone pair.

Sound intensity measurement systems containing a sound intensity probe set can be conveniently calibrated using a Sound Intensity Calibrator Type 3541 (see Fig. 2).

This permits simultaneous sensitivity adjustment of both channels of the processor (in pressure, particle velocity or intensity modes) and allows determination of the 20 Hz–5 kHz Pressure-Residual Intensity Index of the probe and processor combinations.

Further details can be found in the separate Product Data for Type 3541.

## Specifications

### COMPLIANCE WITH STANDARDS



Compliance with EMC Directive and Low Voltage Directive of the EU  
Compliance with the EMC requirements of Australia and New Zealand

### GENERAL SPECIFICATIONS – TYPE 4939

**Sensitivity:** 4 mV/Pa  
**Frequency:** 4 Hz – 100 kHz  
**Dynamic Range:** 28 – 164 dB  
**Temperature:** –40 to +150°C (–40 to +302°F)  
**Polarization:** 200 V External

### MICROPHONE MATCHING

**SPECIFICATIONS – TYPE 4178**  
**Phase Response Difference (1/3-octave centre frequencies):**  
100 Hz–200 Hz: ±0.2 deg/f [Hz]  
200 Hz–1 kHz: ±0.1 deg  
1 kHz–20 kHz: ±0.1 deg×f [kHz]  
**Amplitude Response Difference (normalised at 200 Hz):**  
<0.3 dB: 100 Hz to 10 kHz  
<0.5 dB: 100 Hz to 20 kHz

## Ordering Information

**Type 4178** Sound Intensity Microphone Pair

**Includes the following accessories:**

2 × Type 4939 1/4" Free-field Microphone  
UC 0196 6 mm Spacer  
UC 0195 12 mm Spacer

### OPTIONAL ACCESSORIES

Type 2683 Dual Pre-amplifier for Sound Intensity Probes  
Type 3541 Sound Intensity Calibrator (includes Pistonphone Type 4228)

Type 3595 Sound Intensity Probe Kit for Hand-held Analyzers  
Type 3599 Sound Intensity Probe Kit

Brüel & Kjær reserves the right to change specifications and accessories without notice

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