

# PRODUCT DATA

## ½" Low-noise Free-field TEDS Microphones Type 4955 and 4955-A

Although standard 1" and ½" microphone solutions adequately cover the majority of noise measurements under IEC, ISO and ANSI standards, there is an increasing need for measurements below the noise floor of the standard solutions.

In these cases, Brüel & Kjær's Type 4955 is the optimal choice. A ½" all-titanium, noise-optimised microphone cartridge with laser-welded diaphragm, is combined with a low-noise preamplifier with 20 dB gain. The result is a system with low noise, high sensitivity, excellent long-term stability and outstanding corrosion resistance.

Type 4955 TEDS microphone has a noise floor typically less than 5.5 dB (A), hence allowing measurements well below 10 dB(A).

Type 4955-A is a special version optimised for use with Brüel & Kjær Hand-held Analyzer Types 2250<sup>†</sup>, 2260 and 2270.



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### Uses and Features

#### Uses

- Sound power measurements
- Low-level measurements
- In-cabin measurements
- Measurements in strong magnetic fields
- Homeland security applications
- With hand-held analyzers

- Slim-line, true ½" solution
- Optimised frequency response up to 20 kHz
- Maximum SPL up to 110 dB
- Type 4955: includes built-in over-voltage protection for use with NEXUS conditioning amplifiers
- Type 4955-A: for use with Types 2250<sup>†</sup>, 2260 and 2270, and other front-ends not exceeding ±18V supply voltage
- Temperature compensation
- True omnidirectional response
- All titanium construction
- Excellent long-term stability

#### Features

- Sensitivity 1.1 V/Pa
- Guaranteed noise floor <6.5 dB(A)

### Introduction

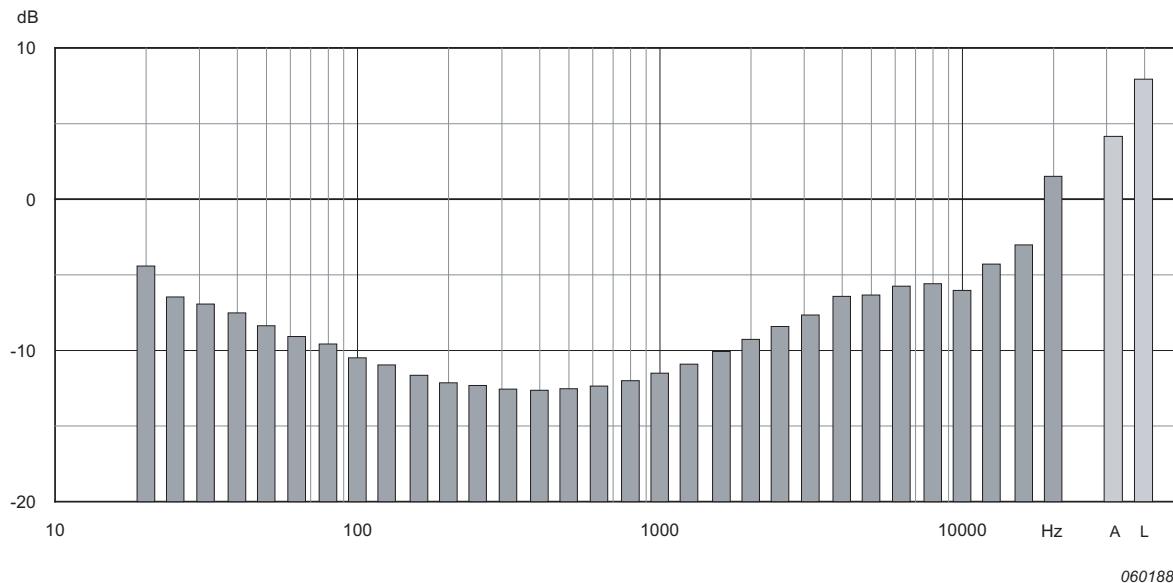
Every microphone has an inherent noise caused, amongst other things, by Brownian movements. This results in a noise voltage, which cannot be avoided even with the best microphone.

A microphone with a higher sensitivity will inherently have a better signal-to-noise ratio. That is why some low-noise microphones are 1" types. However, the larger the microphone the more it will disturb the sound field, even at relatively low frequencies.

High quality, conventional 1" condenser microphones such as Brüel & Kjær Types 4144 and 4145 have a typically inherent noise level of 10 dB(A). Together with a high quality preamplifier, such as Brüel & Kjær Type 2669, they provide a combined noise floor of around 11 dB(A), hence a useful measurement range from around 14 dB and up. Similar high sensitivity half-inch types, such as Types 4189 and 4190, allow measurements from around 19 dB(A), and due to their smaller dimensions, cover a wider frequency range – up to 20 kHz. A high sensitivity of the microphone preamplifier system also has the advantage that the noise of the input stage contributes less to the total system noise.

Low-noise TEDS Microphone Type 4955 consists of a high sensitivity  $\frac{1}{2}$ " cartridge, which has been optimised for the lowest inherent noise.

**Fig. 1** Typical noise spectrum of Type 4955 in 1/3-octave bands and overall A-weighted and linear levels



## Description

In order to avoid contamination that would cause increased self-noise, the cartridge-preamplifier is laser-welded and forms one unit. The complete transducer is assembled and adjusted in a clean room environment, guaranteeing low noise over a long period and under critical environmental conditions, such as high temperatures and high humidity. The low-noise preamplifier has a gain of 20 dB and is followed by a carefully designed filter for linearisation of the free-field response of up to 20 kHz. The output stage of the preamplifier has low output impedance and high current-drive capability.

Special precaution has been taken in order to attenuate noise on the power supply. A temperature sensing element compensates for the cartridge temperature drift, producing a combined temperature drift for the complete transducer of less than  $\pm 0.01$  dB/K.

Type 4955 includes a circuit that protects against accidental use with the high ( $\pm 40$  V) transducer voltage possible with NEXUS. This protection circuit is not compatible with Sound Level Meters Type 2250, 2260 and 2270, and Type 4955-A must be chosen for these instruments. Type 4955-A can also be used with PULSE and NEXUS units, but will be damaged if NEXUS is set to high transducer voltages (see Table 1).

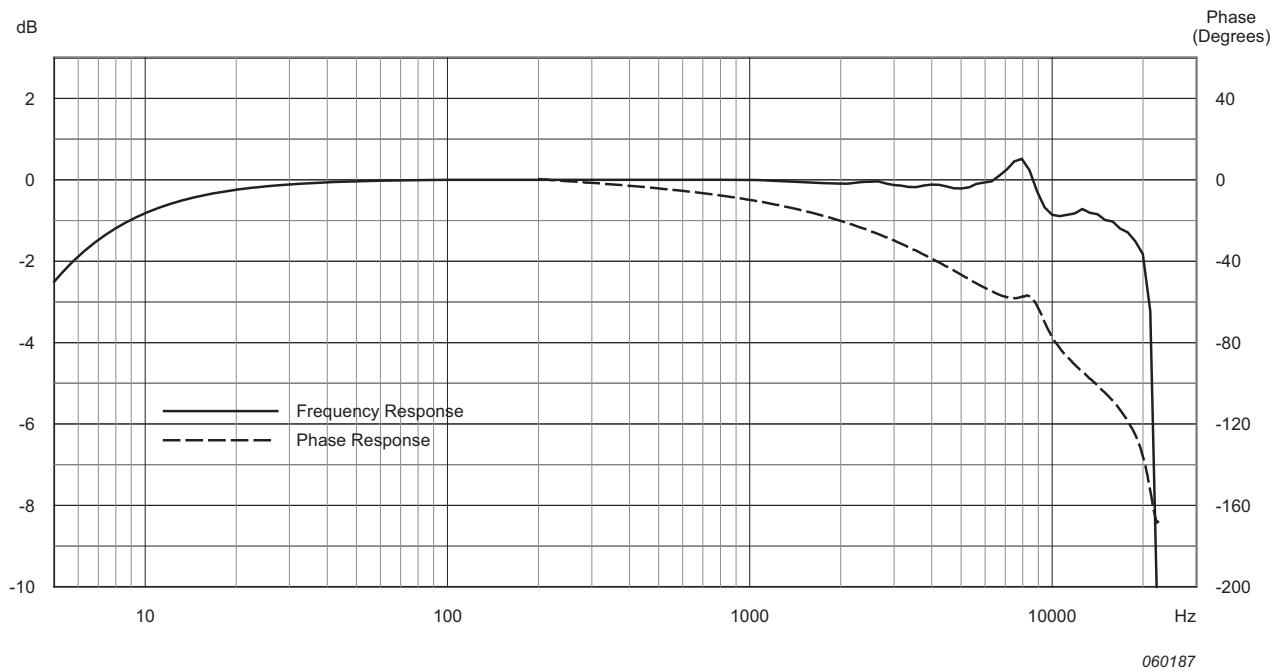
Since calibration using an electrostatic actuator is not possible for this microphone, the protection grid has been permanently glued – there is no reason to remove the grid. Sensitivity calibration can easily be performed using a sound calibrator with 94 dB SPL, such as Brüel & Kjær Sound Calibrator Type 4231.

**Table 1**  
Use of Types 4955 and 4955-A at various supply voltages

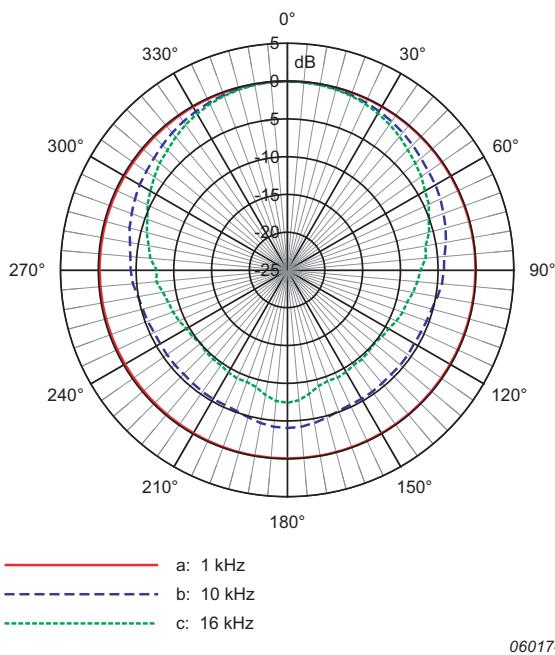
Supply Voltage (V)	Product	Type 4955	Type 4955-A
$\pm 14$ and $\pm 15$	NEXUS (Auto and 14 V), LAN-XI, IDA <sup>e</sup>	OK	OK
$\pm 18$	Types 2250, 2260 and 2270	Noise floor 10 – 20 dB higher than specified	OK <sup>f</sup>
$\pm 40$	NEXUS (40 V)	Noise floor 10 – 20 dB higher than specified	Damage Type 4955-A
$\pm 50$ and $\pm 60$	Type 2829 and some non-Brüel & Kjær products	Damage Type 4955	Damage Type 4955-A

Each microphone is individually calibrated and comes with a calibration chart plus an individual mini CD with calibration and frequency response data in comma separated file format shown in 1/12-octave frequencies from 1 Hz to 20 kHz.

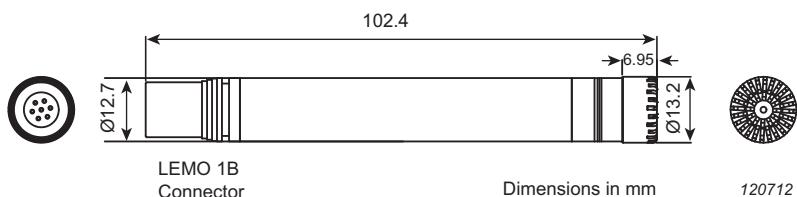
**Fig. 2** Typical free-field frequency and phase responses\*



**Fig. 3**  
Typical directivity plot



**Fig. 4**  
Dimensions of  
Type 4955



\* Note: Although Type 4955 is an externally polarized microphone, positive-going pressure on the diaphragm will result in a positive-going output voltage.

## Specifications – ½" Low-noise Free-field TEDS Microphones Type 4955 and 4955-A

Dynamic Characteristics*		
Transducer Sensitivity	1.1 V/Pa, ±3 dB	
Frequency Response (free-field response, 0° incidence)	10 Hz – 16 kHz: ±2 dB; 5 Hz – 20 kHz: ±3 dB	
Total System Noise <sup>†</sup>	< 6.5 dB(A), < 5.5 dB typically	
3% Distortion Limit <sup>‡</sup>	>110 dB re 20 µPa below 6 kHz, 97 dB in the total frequency range	
THD @ 94 dB SPL and 1 kHz	< 0.003%	
Maximum Sound Pressure Level	136 dB (peak) non-destructive	
Electrical Characteristics*		
Supply Voltage	4955: ±14 V to ±15 V (protection up to ±40 V); 4955-A: ±14 V to ±18 V	
Polarization Voltage	External: 200 V	
Supply Current	7 mA (max. 9 mA)	
Output Impedance	< 50 Ω	
Environmental Characteristics*		
Operating Temperature Range	-20 to +100°C (-4 to +212°F)	
Temperature Coefficient	±0.01 dB/K @ 250 Hz (-10 to +50°C (+14 to +122°F))	
Pressure Coefficient	-0.03 dB/kPa	
Storage Temperature	in microphone box in box with mini CD	-30 to +70°C (-22 to +158°F) -20 to +70°C (-4 to +158°F)
Operating Humidity Range	0% – 100% RH without condensation	
Influence of Humidity	< 0.1 dB in the absence of condensation	
Magnetic Field Sensitivity	No detectable influence from a 80 A/m, 50 Hz field	
Estimated Long-term Stability	< 0.003 dB/year @ +20°C (+68°F); < 1 dB/hr @ +150°C (+302°F)	
Physical Characteristics		
Dimensions	12.7 mm (½")	
Weight	34 g (1.2 oz.)	
Length	102.7 mm (4.04")	
Connector	LEMO 1 B	
Pressure Equalization Vent	Front vented	
TEDS UID	116289	

\* Unless otherwise specified, the data is valid at +23°C (+73°F), 101.3 kPa, 50% RH and ±14 V supply

† Type 4955-A used with Type 2250 with hardware version 2.0 (or later) or serial number greater than 2630299. For earlier versions please contact Brüel & Kjær and refer to 2250 TR4 for further information

‡ Reduced specification for Type 2260

### COMPLIANCE WITH STANDARDS

 Compliance with EMC Directive and Low Voltage Directive of the EU



Compliance with the EMC requirements of Australia and New Zealand

### Ordering Information

#### Type 4955 ½" Low-noise Free-field TEDS Microphone

Includes:

- Calibration Chart and Mini CD with individual calibration data

#### Type 4955-A ½" Low-noise Free-field TEDS Microphone

Includes:

- Calibration Chart and Mini CD with individual calibration data
- AO-0645-D-030: Microphone Cable for connection to Hand-held Analyzer (3 m)

#### OPTIONAL ACCESSORIES

- AO-0414-D-030 Microphone Cable, 3 m
- AO-0414-D-100 Microphone Cable, 10 m
- AO-0414-D-300 Microphone Cable, 30 m
- Type 4231 Sound Calibrator
- UA-0237 Windscreen, diameter 90 mm
- UA-0254 6-pack of UA-0237
- 4955-CFF ½" Low-noise Free-field TEDS Microphone, Factory Standard Re-calibration

#### For Type 4955-A:

- AO-0697-D-xxx Hand-held Analyzer 10-pin Extension Cable (0.5 to 50 m)

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