NOISE LEVEL ANALYZER
Type 4427

From serial no. 1142305

May 1985

Specifications 4427

COMMON AC INPUT SPECIFICATIONS:
Input Signal Range: 10 μV to 3,16 V RMS
Input Impedance: 100 kΩ//40 pF
Input Noise: < 3,16 μV RMS (A or Lin.)
Frequency Response: See Figs. 12 and 13
Frequency Weighting: Linear 20 Hz to 20 kHz (Lin). A-weighting to IEC 651 and ANSI S1.4 (1983) type 0.
Maximum Input Voltage: 3,16 V RMS

PREAMPLIFIER INPUT:
7-pin socket on rear panel provides power for B&K Preamplifier Type(s) 2633, 2639, 2645 or 2660
Microphone Polarization: 0, 28 and 200 Volts from 20 MΩ source
Preamplifier Voltage: + 50 V from 1 kΩ source (1 mA max.)
Heater Voltage: + 12 V from 100 Ω source (50 mA max.). May be switched off to conserve power
Measuring Ranges:
With nominal microphone sensitivities and Preamplifier Type 2639, measuring ranges are given in the table:

Microphone Type	Lower limit for S/N ratio 5 dB		Max. peak Level [dB]	Upper limit for signals of crest factor = 10 (20 dB)
	Lin. [dB]	A [dB]		
4133[1]	32	32	145	125
4133[2]	49	49	162	142
4145	22	20	133	113
4165[1]	25	22	133	113
4155	25	22	133	113
4179	8,6	2,7	97	77

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[1] Using Microphone Type 4133 or 4165; the measuring system complies with IEC 651 Type 0

[2] Only when used at 28 V polarization voltage

Calibration: Range set automatically on calibration with Sound Level Calibrator Type 4230 or Pistonphone Type 4220
Scaling: Set dB level equivalent to 1 V RMS input

DIRECT INPUT:
Via standard BNC socket on the rear panel.
Calibration/Scaling: Range set via keyboard on entry of calibration signal / set dB level equivalent to 1 V RMS input

DC-INPUT:
Via standard BNC socket on the rear panel
Logarithmic DC Input Sensitivity:
100 mV/dB
Input Range: 0 V to + 11 V DC
Resolution: Better than 0,2 dB
Input Impedance: 100 kΩ
Calibration/Scaling: Range set via keyboard on entry of dB level equivalent to 10 V
Maximum Input Voltage: 11 V

DETECTOR:
Dynamic Range: 110 dB for RMS and L_{eq} 90 dB for Peak
Input Sampling Frequency: 131 kHz
Linearity Range: 110 dB
Pulse Range: 113 dB
Crest Factor Capability: 3 dB at the top of the linearity range. Increases proportionally at lower levels to a theoretical maximum of 113 dB
Peak Rise Time: < 50 μs
Lowest frequency for which the error from non-linear distortion is less than ± 1 dB: 10 Hz (A and Lin.)
L_{eq} Response Time for Constant signal: 1 second
Detector Output Sampling Rate: 64 RMS or Peak samples/second plus 1 true L_{eq} value-/second. For measurements of Taktmaximal output of 1 L_{FTm} value every 3 or 5 s, or 1 L_{lm} value/second

Two parallel processed detector characteristics:

RMS/Peak Detector	L_{eq} Detector	
Peak Mode:		
Peak[1]	True	L_{eq} [2]
RMS Mode:		
"F" (Fast)[1]	True	L_{eq} [2]
"S" (Slow)[1]	True	L_{eq} [2]
"I" (Impulse)[1]	True	L_{eq} [2]
Taktmax. 3 s [3]		L_{FTm3} [3]
Taktmax. 5 s [3]		L_{FTm5} [3]
"I" (Impulse)[1]	"I"-weighted	L_{lm} [3]

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[1] To IEC 651 and ANSI S1.4 (1983) Type 0

[2] To proposed IEC Standard for Integrating Sound Level Meters Type 0

[3] To DIN 45 645

ACCURACY:
RMS & L_{eq}: ± 0,5 dB over whole 110 dB dynamic range & 20 Hz to 20 kHz frequency range. Resolution: 0,1 dB
Peak: ± 1,0 dB over 90 dB dynamic range and 20 Hz to 20 kHz frequency range. Resolution: better than 0,2 dB

MEMORY
Number of Samples: 64 samples/s into 550 class intervals.
Resolution: 0,2 dB class intervals
Storage capability: 16777216 (2^{24}) samples

CENTRAL PROCESSING UNIT
Collects data from the Detector, performs classification of data, statistical analysis and controls the display and printer.

PROGRAMS:
In automatic mode the instrument is controlled by three programs consisting of:
1 Input Program
1 Timing Program
1 Output Program

INPUT PROGRAMS:
9 Input Programs stored in non-volatile memory, consisting of:
3 permanent and pre-defined
6 user-definable programs
Input Program used to select:
Input: Preamplifier, AC-direct or DC
Calibration level/Scaling factor: For AC direct and preamp inputs
Scaling Factor: for DC input
Weighting: A-weighting or Lin.
Detector Settings: "F", "S", "I" or Peak
L_{eq}: True or "I" weighted
TaktMaximalpegel: 3 s or 5 s
Possible Detector setting combinations: see specification section "DETECTOR"

TIMING PROGRAMS:
9 Timing Programs stored in non-volatile memory, consisting of:
3 permanent and pre-defined
6 user-definable programs
Timing Programs are used to set periods for:
Short Term Measurements: Can be set in 1 s steps from 10 to 3600 s (60 mins.)
Medium Term Measurements: 3 successive time periods within a 24 hour period. Minimum time period 1 min. Within each period a day-night correction can be added to the microphone sensitivity in 1 dB increments from 0 to 20 dB
Long Term Measurements: A 24 hour period starting at the start-time of the first medium term period.
Reset of Statistical Data: Statistical Data is cleared from memory at the end of the Time Period which it is set to follow.

OUTPUT PROGRAMS:
9 Output Programs stored in non-volatile memory, consisting of:
3 permanent and pre-defined
6 user-definable programs
Output Program used to select: Parameters to be output at the end of the measurement period. The output program for each Timing Period can have up to 9 special functions included. The output format: tabular, graphical or print of single parameters

PARAMETERS AVAILABLE:

Parameter	Disp.	Print	Plot
Time, Day, Month, Year	✓	✓	–
Supply Voltage	✓	✓	–
Inst. Sound Level	✓	✓	✓
Cumulative Distribution	✓	✓	✓
Probability Distribution	✓	✓	✓
Running 1 sec. L_{eq}	✓	(✓)	✓
Short Term L_{eq}	✓	✓	–
Medium Term L_{eq}	✓	✓	–
Long Term L_{eq}	✓	✓	–
SEL	✓	✓	–
L_N [N = 0 – 100 in 0,1% steps]	✓	✓	–
Noise Pollution Level	✓	✓	–
Traffic Noise Index	✓	✓	–
Mean (μ) and S.D. (σ)	✓	✓	–
Single Event Meas.	✓	✓	✓
Single Event EPN	✓	✓	✓
L_{eq} in Periods	(✓)	✓	–
$L_{eq, 3\,dB}$ with Threshold	✓	✓	–
$L_{eq, 4\,dB}$ with Threshold	✓	✓	–
$L_{eq, 5\,dB}$ with Threshold	✓	✓	–
Data Over range	✓	✓	–
Data Under range	✓	✓	–
Data Inhibit	–	✓	–

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SPECIAL FUNCTIONS:
Noise Ratings:
Standard Deviation (σ) and Mean Value (μ):
Noise Pollution Level (L_{NP}):
Traffic Noise Index (TNI):
Single Event Measurement:
Single Event Measurement
Set Level and delay
Single Event Measurement
Print Immediately
Single Event Measurement
Print All
Single Event Measurement
Print Summary
Event EPN Level
Print Immediately
Event EPN Level
Print All

Event EPN Level
Print Summary
Plot Noise Event
Extra L_{eq} Measurements:
$L_{eq,3dB}$ with Threshold:
$L_{eq,4dB}$ with Threshold:
$L_{eq,5dB}$ with Threshold:
Data Exclusion:
Data Under Range
Data Over Range
Data Inhibited
Manual Output of Data:
Short Term Data
Medium Term Data
Long Term Data
Auxiliary Equipment Control:
Tape Recorder start
Remote Microphone Calibration Check
Miscellaneous:
Set Year and Day of Week
Print Date and Time
Print Label Number
Lines for Remarks
Maximum Level Hold
Quick Display of Sound Level
Instrument Test:
Display Test
Printer Test
Print in Data
Pushkey Test
RAM Test
ROM Test
Print Sound Level Data in Hexadecimal
Standard Test Data
Data Inhibit Check

OVERLOAD WARNING:
⌐ In display indicates an overload. Flag remains for 1 s.
Flashing display indicates an overload has occurred in averaging period if L_{eq} or SEL measurements are being made
⌐ In display indicates signal is under-range

PRINTER:
Dot-matrix printer onto electrosensitive metallised paper.
Text: 5 × 9 matrix, 21 characters per line
Curves: 128 points per line
Paper Speed: 1, 4, 10 or max. (approx. 125 mm/min).
Paper Width: 70 mm
Paper Length: 30 m per roll

IEC/IEEE INTERFACE:
Conforms with IEC 625-1 standard, compatible with IEEE Std. 488
Interface functions implemented: AH1, SH1, L4, T7, RL1
Remote Control of all functions (except Power Off & Manual/Auto)
Special Features: Printer On/Off by switch on back panel or by a remote control function. All data sent to printer (except curves) can be read out to bus. Line printer mode — 4427 can print data sent over bus. Talk only mode — data can be read out in parallel with printer. Terminator SR3 switchable to EOI∧LF or EOI∧ETX

RS 232/MODEM INTERFACE (OPTIONAL):

Conforms with the EIA Standard RS 232C (equivalent to CCITT V 24)
Allows remote activation of the front panel pushkey functions via a non-intelligent terminal either directly or via a modem. All data sent to the 4427 printer including curves can be displayed on the terminal screen.

MANUAL SAMPLING CONTROL
Start: Start followed by pressing ENTER empties data store and commences sampling and store of new data
Pause: Stops sampling
Continue Recommences sampling without clearing stored data

DATA INHIBIT FUNCTION
Operator controlled data exclusion period incorporating 1, 2 or 4 seconds of preceding data

AC OUTPUT:
BNC socket output before detector
Output for Full Scale: 3,16 V RMS
Output Noise (input short circuit): $< 5\,\mu V$ over 20 kHz bandwidth
Output Impedance: 50 Ω
Maximum Load: 10 kΩ//200 pF

COMPRESSED AC OUTPUT:
Jackplug socket monitoring via headphones or recorder. Power supply to compressor is disconnected when jack is removed
Output for Full Scale: 1 V RMS
Dynamic Range: 40 dB
Output Impedance: 50 Ω
Maximum load: 600 Ω (headphone)

POWER SUPPLY:
Internal: Battery Cassette (ZG 0230) with 12 Ni-Cd Batteries (QB 0008) or 12 Alkaline Batteries (QB 0004)
Operating Time: Approximately 40 hours with Alkaline QB 0004. Approximately 24 hours with Ni-Cd QB 0008. May be charged via Battery Charger ZG 0166. Time to recharge to full capacity - approx. 10 hours
External: When operated from 12 - 15 V battery (e.g. Car battery), power consumption is 4 VA. Tested according to IEC 348

WARM-UP TIME:
Direct AC or DC Input: < 10 seconds
Preamplifier Input: < 2 minutes

INFLUENCE OF MAGNETIC FIELDS:
80 A/m (1 Ørsted) at 50 Hz gives $< 10\,\mu V$ A and Lin. referred to input

INFLUENCE OF TEMPERATURE (At 1 kHz):
Operating Range: – 10 to + 50°C (+ 14 to + 122°F)
Variation in Sensitivity: < ± 0,5 dB from – 10 to + 50°C (+ 14 to + 122°F)
Storage without Batteries: – 20 to + 70°C (– 4 to + 158°F)

EFFECT OF HUMIDITY:
< ± 0,5 dB variation in sensitivity for 30% < RH < 90% (tested at 30° C), provided no condensation occurs

WEIGHT:
6,5 kg (approximately 8 kg with batteries)

CABINET:
Supplied as model A (light-weight metal cabinet),
model B (model A in mahogany case), or
model C (as A but with flanges for standard 19 inch rack)

DIMENSIONS:
Metal cabinet excluding knobs and feet
Height: 133 mm (5,3 ins)
Width :430 mm (16,9 ins)
Depth :200 mm (7,9 ins)

ACCESSORIES INCLUDED:

1 Battery Box	ZG 0230
2 Keys	QA 0132
1 Package Recording Paper (5 rolls)	QP 9601
3 BNC plug	JP 0035
1 Jack plug	JP 0329
2 6-pin DIN plug	JP 0600
1 7-pin DIN plug	JP 0710
1 IEC-Bus Connector Kit	UA 0793
2 Spare Fuses	VF 0010

ACCESSORIES AVAILABLE:
Microphones and Preamplifiers:
Any general-purpose microphone and preamplifier in the B & K range may be used, including the following:

Microphone	Type 4145
Microphone	Type 4165
Microphone	Type 4155
Microphone	Type 4133
Microphone Preamplifier	Type 2633
Microphone Preamplifier	Type 2639
Microphone Preamplifier	Type 2645
Microphone Preamplifier	Type 2660

General:

Charger	ZG 0166
Ni-Cd Battery	QB 0008
Carrying Case	KA 2004
Pistonphone	Type 4220
Sound Level Calibrator	Type 4230
Adapter (Microphone Plug)	DB 2609
Microphone Extension Cable:	
3 m	AO 0027
10 m	AO 0028
30 m	AO 0029
BNC Cable	AO 0087, AO 0133
7-core DIN Cable	AQ 0035
6-core DIN Cable	AO 0162
IEC Cable	AO 0194
IEC/IEEE Cable	AO 0265
RS 232 / Modem Interface	ZI 0052
1 Package Recording Paper (5 rolls)	QP 9601

For outdoor use:

Outdoor Microphone Unit	Type 4921