BRÜEL & KJÆR® Data Acquisition Hardware

LAN-XI Light 4-channel Data Acquisition Module Types 3676 and 3677

LAN-XI Light Types 3676 and 3677 are stand-alone, 4-channel 25.6 kHz data acquisition units that are designed to cover a wide range of sound and vibration real-time analysis applications.

As part of the renowned LAN-XI hardware platform, both modules offer quality, durability and reliability for low-channel-count measurement set-ups. Their rugged design makes them well-suited for use in the field, as well as the lab.

The analogue input channels cover signals with frequencies from DC to 25 kHz, which is ideal for many NVH applications. They support direct voltage signals and transducers with TEDS (transducer electronic data sheet). They also provide conditioning for CCLD transducers such as microphones, accelerometers, binaural recording headsets and Sound Quality HATS.

LAN-XI also supports a programmer's interface: LAN-XI Open API (application protocol interface). All modules include access to the API as standard.



Type 3676
Type 3677
(with optional front panel UA-3102-041)

***Type 3676** includes Front Panel UA-2100-040, which has:*
- *Four input channels with BNC connectors*

Other front panels cannot be used with the Type 3676 module.

***Type 3677** includes Front Panel UA-3100-041, which has:*
- *Four input channels with BNC connectors*
- *One output channel with BNC connector with a frequency range: 0 to 25.6 kHz.*
  The output channel can be used as a high-quality signal generator to supply the signals necessary for performing system analysis in audio, electroacoustic and vibration test applications

You can detach Type 3677's standard front panel, UA-3100-041, and exchange it with optional Front Panel UA-3102-041 to support 200 V microphones requiring 7-pin LEMO connectors.

Uses and Features

Uses

As a data acquisition solution for NVH Simulator, Sonoscout™, BK Connect®, PULSE™ LabShop and PULSE Time Data Recorder software applications, LAN-XI Light provides real-time analysis for:
- General sound and vibration measurements
- NVH (noise, vibration and harshness) recording and analysis
- Monitoring vehicle parameters
- Sound quality metrics (loudness, sharpness, articulation index)

Features

- DC to 25.6 kHz input range (sampling rate 65.5 kHz)
- Built-in constant current line drive (CCLD) to power sensors
- LAN interface
- LED indicators on each channel (conditioning, cable break)
- Power: Mains, DC, battery or PoE (IEEE 802.3af)
- Robust casing
- Platform-independent open API
- Stand-alone recorder application (LAN-XI Notar)
- Generator (Type 3677 only):
  - One output channel with full generator functionality from 0 to 25.6 kHz
  - Can be set up using graphical tools of BK Connect. Control excitation type, frequency parameters, output level, level ramp up/down times, and burst excitation
  - Waveforms determined by software. BK Connect supports sine (fixed frequency), stepped sine, continuous and burst random, periodic and pseudo-random, white noise and user-defined waveforms

Compliance with Standards

	The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EU directives RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME China RoHS mark indicates compliance with administrative measures on the control of pollution caused by electronic information products according to the Ministry of Information Industries of the People's Republic of China WEEE mark indicates compliance with the EU WEEE Directive
Safety	EN/IEC 61010-1 and ANSI/UL 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use
EMC Emission	EN/IEC 61000-6-4: Generic emission standard for industrial environments EN/IEC 61000-6-3: Generic emission standard for residential, commercial, and light-industrial environments CISPR 32: Radio disturbance characteristics of information technology equipment. Class B Limits
EMC Immunity	EN/IEC61000-6-1: Generic standards – Immunity for residential, commercial and light industrial environments EN/IEC 61000-6-2: Generic standards – Immunity for industrial environments EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements **NOTE:** The above is only guaranteed using accessories listed in this document
Temperature	IEC 60068-2-1 & IEC 60068-2-2: Environmental Testing. Cold and Dry Heat Ambient Operating Temperature: –10 to +55 °C (14 to 131 °F) Storage Temperature: –25 to +70 °C (–13 to +158 °F)
Humidity	IEC 60068-2-78: Damp Heat: 93% RH (non-condensing at 40 °C (104 °F))
Mechanical (non-operating)	IEC 60068-2-6: Vibration: 0.3 mm, 2 g, 10 – 500 Hz IEC 60068-2-27: Shock: 100 g IEC 60068-2-29: Bump: 1000 bumps at 25 g
Enclosure	IEC 60529: Protection provided by enclosures: IP 31

Specifications – LAN-XI Light Stand-alone Data Acquisition Module (25.6 kHz) Types 3676 and 3677

POWER REQUIREMENTS

DC Input: 10 – 32 V DC
Connector: LEMO, FFA.00.113, ground on shield
Power Consumption:
- **DC Input:** <15 W
- **Typical Operating Time on Battery Type 2831-A:** > 7 hours
- **Supply via PoE:** According to IEEE 802.3af, max. cable length 100 m

Temperature Protection: Temperature sensor limits module's internal temperature to 80 °C (176 °F). If temperature exceeds limit, system will shut down the module

LAN

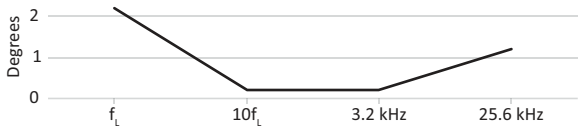
Connector type RJ45

DIMENSIONS AND WEIGHT

Height: 132.6 mm (5.22 in)
Width: 27.5 mm (1.08 in)
Depth: 248 mm (9.76 in)
Weight: 750 g (1.65 lb)

ANALOGUE INPUT CHANNELS

Frequency Range		DC to 25.6 kHz or any range defined by high-pass filters and by software decimation set under 'frequency span'			
Sampling Rate		65.5 k samples/s			
A/D Conversion		24 bit			
Data Transfer		24 bit			
Input Voltage Ranges	Type 3676	1 – 10 V_{peak}			
	Type 3677	0.25 – 10 V_{peak}			
Input Signal Coupling	Differential	Signal Ground is 'Floating' (1 MΩ re chassis)			
	Single-ended	Signal ground is connected to chassis ('Grounded')			
Input Impedance		Direct: 1 MΩ || <300 pF CCLD: >100 kΩ ||<300 pF			
Absolute Maximum Input		±60 V_{peak} without damage			
High-pass Filters * Defined as the lower frequency, f_L, for guaranteed fulfilment of –0.1 dB accuracy ** Defined as the nominal –10%/–3 dB filter frequency *** Single analogue pole and 2nd order digital filter section		**– 0.1 dB ***	**–10% @ ****	**–3 dB @ ****	**Slope**
	0.1 Hz –10% digital high-pass filter	0.5 Hz	0.1 Hz	0.05 Hz	–20 dB/dec.
	0.7 Hz –0.1 dB digital high-pass filter	0.7 Hz	0.15 Hz	0.073 Hz	
	1 Hz –10% analogue high-pass filter	5 Hz	1.0 Hz	0.5 Hz	–20 dB/dec.
	7 Hz –0.1 dB digital high-pass filter	7 Hz	1.45 Hz	0.707 Hz	
	22.4 Hz –0.1 dB analogue*** high-pass filter	22.4 Hz	14.64 Hz	11.5 Hz	–60 dB/dec.
	Intensity filter (analogue)	112 Hz	23.00 Hz	11.2 Hz	–20 dB/dec.

Absolute Amplitude Precision, 1 kHz, 1 V_{input}		±0.05 dB, typ. ±0.01 dB	
Amplitude Linearity (linearity in one range)	0 to 60 dB below full scale	±0.1 dB, typ. ±0.01 dB	
	60 to 80 dB below full scale	±0.2 dB, typ. ±0.02 dB	
	80 to 100 dB below full scale	typ. ±0.05 dB	
Overall Frequency Response, re 1 kHz, from lower limit f_L to upper limit f_U f_L is defined as the lower frequency for guaranteed fulfilment of −0.1 dB accuracy (see High-pass Filters) f_U is defined as the chosen frequency span		±0.1 dB	
Noise: **Measured lin. 10 Hz to 25.6 kHz** (Input terminated by 50 Ω or less)	**Input Range**	**GUARANTEED**	**TYPICAL**
	0.25 V_{peak} (Type 3677) or 1 V_{peak} (Type 3676)	< 7.5 μV_{rms} (< 47 nVrms/√Hz @ 1 kHz)	< 5.5 μV_{rms} (< 35 nV_{rms}/√Hz @ 1 kHz)
	10 V_{peak}	< 75 μV_{rms} (< 470 nV_{rms}/√Hz @ 1 kHz)	< 55 μV_{rms} (< 350 nV_{rms}/√Hz @ 1 kHz)
Spurious-free Dynamic Range re full-scale input (Input terminated by 50 Ω or less) Spurious-free dynamic range is defined as the ratio of the rms full-scale amplitude to the rms value of the peak non-harmonic spectral component	**Input Range**	**TYPICAL**	
	0.25 V_{peak} (Type 3677) or 1 V_{peak} (Type 3676)	130 dB	
	10 V_{peak}	130 dB 120 dB with DC coupling	
DC Offset re Full Scale Measured after automatic DC compensation at current temperature when changing from AC to DC coupling or changing input range when DC coupled		**GUARANTEED**	**TYPICAL**
		< −80 dB	< −90 dB
Harmonic Distortion (all harmonics)		**GUARANTEED**	**TYPICAL**
		−80 dB in 0.25 V (Type3677) or 1 V (Type 3676) range, −75 dB in 10 V range	−100 dB @ 1 kHz
Crosstalk: Between any two channels	**Frequency Range**	**GUARANTEED**	**TYPICAL**
	0 – 25.6 kHz	< −80 dB	−100 dB
Channel-to-Channel Match Input ranges: • 10 V_{peak} • 0.25 V_{peak} (Type 3677) • 1 V_{peak} (Type 3676)		**GUARANTEED**	**TYPICAL**
	Maximum Gain Difference f_L is defined as the −0.1 dB filter frequency	0.2 dB from lower frequency limit, f_L, to 25.6 kHz (0.4 dB at −10% filter frequency)	±0.05 dB
	Maximum Phase Difference f_L is defined as the −0.1 dB filter frequency	 *180162*	
Common Mode Rejection		**GUARANTEED**	**TYPICAL**
	0.1 – 120 Hz	60 dB	65 dB
	120 Hz – 1 kHz	50 dB	55 dB
	1 kHz – 25.6 kHz	30 dB	40 dB
Absolute Max. Common Mode Voltage		±5 V_{peak} without damage	
		±3 V_{peak} without clipping	
		If common mode voltage exceeds the max. value, care must be taken to limit the signal ground current in order to prevent damage. Maximum is 100 mA. The instrument will limit the voltage to the stated max. 'without damage' common mode value	
Anti-aliasing Filter At least 90 dB attenuation of those frequencies that can cause aliasing	**Filter Type**	3rd order Butterworth	
	−0.1 dB @	25.6 kHz	
	−3 dB @	64 kHz	
	Slope	−18 dB/octave	
Supply for Microphone Preamplifiers (Type 3677 only)		±14.0 V, max. 100 mA per channel (max. 100 mA total/module)	
Supply for Microphone Polarization (Type 3677 with UA-3102-041 only)		200 V ±1 V, or 0 V (set per channel)	
Supply for CCLD		3.6 mA from 24 V source	
		If any CCLD-coupled channel is paralleled with another channel, this must also be CCLD-coupled. Otherwise the signal might be clipped by the paralleled channel	
Tacho Supply		CCLD for Type 2981 (Power supply for legacy types MM-0012 and MM-0024 not available)	
Analogue Special Functions		**Microphone Charge Injection Calibration (CIC)**: Type 3677 with optional front panel UA-3102-041 (7-pin LEMO) supports CIC via dedicated application software and Automation interface **Transducers:** Supports IEEE 1451.4-capable transducers with standardized TEDS	

Overload Detection	**Signal Overload:** Detection level in 0.25 V range: ±0.25 V_{peak}; in 10 V range: ±10 V_{peak} (in CCLD mode: ±7 V_{peak}) **CCLD Overload:** Detection of cable break or short-circuit + detection of CCLD transducer working point fault. Detection level: +2 V/20 V **Microphone Preamplifier Overload:** Detection of microphone preamplifier current consumption too high or too low. Detection level default is 10 mA/ 1 mA. Adjustable detection level of 1 to 20 mA, or 100 mA if disabled **Common Mode Voltage Overload:** Detection level: ±3 V
Protection	If signal input level exceeds the measuring range significantly, the input will go into protection mode until the signal goes beyond the detection level again – but at least for 0.5 s. While in protection mode, the input is partly switched off and the input impedance is strongly increased. (The measured value will be strongly attenuated but still detectable) Direct mode detection level: ±33 V_{peak} CCLD mode detection level: +27/ −2 V_{peak}

OUTPUT CHANNEL (TYPE 3677 ONLY)

Output Connector		1 × BNC	
Output Coupling		DC	
Signal Ground Coupling		Floating or grounded to chassis	
D/A Conversion		24 bit	
DC Offset (DC Value set to 0 V)		≤1 mV auto-adjusted by loopback (<−80 dB re full scale)	
Output Voltage Range (DC)		0 to ±10 V ±0.5% of requested value	
Output Voltage Range (AC)		10 μV_{peak} – 10 V_{peak}	
Output Impedance		50 Ω	
Output Load		Max. 40 mA_{peak}	
Frequency Range		0 – 25.6 kHz	
Frequency Response re 1 kHz		±0.1 dB, 1 mHz to 25.6 kHz	
Frequency Accuracy		0.00025%	
Frequency Resolution		1 mHz (defined in BK Connect)	
Phase Resolution		100 mdegrees (defined in BK Connect)	
Phase Deviation Between Channels		<20 mdegrees for frequencies below 1 kHz	
Waveform		Software-determined arbitrary waveforms up to 2 Msamples Waveforms available in BK Connect: Single fixed sine (continuous), stepped sine, random (continuous or burst), pseudo-random, periodic random. User-defined, arbitrary waveforms up to 25.6 kHz can be streamed or downloaded.	
Amplitude Linearity @ 1 kHz		**GUARANTEED**	**TYPICAL**
	±0.1 dB	0 – 100 dB below 7 V_{rms}	0 – 110 dB below 7 V_{rms}
Noise μV_{rms} ($nV/\sqrt{Hz}$) in 50 kHz bandwidth		**GUARANTEED**	**TYPICAL**
	up to 316 mV_{peak}	1 μV_{rms} (4.4 $nV/\sqrt{Hz}$)	0.5 μV_{rms} (2.2 $nV/\sqrt{Hz}$)
	up to 10 V_{peak}	10 μV_{rms} (44$nV/\sqrt{Hz}$)	5 μV_{rms} (22 $nV/\sqrt{Hz}$)
Harmonic Distortion Products	0 – 25.6 kHz	<−80 dB re full range output	
Spurious In Band (non-harmonic)	0 – 25.6 kHz	<−100 dB re full range output or 1 µV, whichever is greater	
Spurious Out of Band (non-harmonic)	Up to 1 MHz	<−80 dB re full range output	
Absolute Amplitude Precision		**GUARANTEED**	
	@ 23 °C, 1 kHz, 1 V_{rms}	±0.05 dB	
Crosstalk Between output channels and between any output channel and any input channel terminated by less than 50 Ω (unloaded generator output)	0 – 25.6 kHz	**GUARANTEED** −120 dB	**TYPICAL** −130 dB
Common Mode Rejection		**GUARANTEED**	
	1 Hz – 1 kHz	60 dB	
Maximum Common Mode Voltage		5 V_{peak}, DC – 80 MHz If common mode voltage exceeds the max. value, care must be taken to limit the signal ground current in order to prevent damage. Max. is 100 mA. The instrument will limit the voltage to the stated max. “without damage” common mode value	
Reconstruction Filter		Sixth order Butterworth (−3 dB frequency = 120 kHz typically)	
Attenuation of Mirror Frequencies		>80 dB	
Overload Detection		Reported to BK Connect; indicated by light rings on output connectors for output voltage above 11 V_{peak} and output current above 40 mA_{peak}	

Type 3676-B-040-R LAN-XI Light 4-ch. Stand-alone Input Module, 25.6 kHz

Includes the following accessories:
- UA-2100-040: Detachable front panel with 4 × BNC input connectors
- ZG-0426: Power supply via mains (100 – 240 V)
- AO-1450: LAN Cable, shielded CAT 6, RJ 45 (M), 2 m (6.5 ft)

Type 3677-A-041-R LAN-XI Light 4+1-ch. Stand-alone Input/Output Module, 25.6 kHz

Includes the following accessories:
- UA-3100-041: Detachable front panel with 4 × BNC input connectors and 1 × BNC generator output
- ZG-0426: Power supply via mains (100 – 240 V)
- AO-1450: LAN Cable, shielded CAT 6, RJ 45 (M), 2 m (6.5 ft)

Calibration Services for Data Acquisition Modules

ANA-LNXI-CAF	Accredited Calibration	ANA-LNXI-CTF	Traceable Calibration
ANA-LNXI-CAI	Initial Accredited Calibration	ANA-LNXI-TCF	Conformance Test with Certificate

Supported Brüel & Kjær Products

CABLING AND ADAPTERS

AO-0087-x-yyy*	Cable, coax single screen, BNC (M) to BNC (M), max. +85 °C (+185 °F)
AO-0414-x-yyy*	Cable, 7-pin LEMO (1B F) to 7-pin LEMO (1B M), max. +80 °C (+176 °F)
AO-0479-x-yyy*	Cable, 7-pin LEMO (1B M) to BNC (M), max. +80 °C (+176 °F)
AO-0531-x-yyy*	Cable, coax, 10–32 UNF (M) to BNC (M), max. +80 °C (+176 °F)
JJ-0152	Adapter, T-shaped BNC (M) to dual BNC (F)
JP-0145	Adapter, BNC (M) to 10–32 UNF (F), straight

LAN-XI PLATFORM OPTIONS AND ACCESSORIES

Type 2831-A	Battery Module
UA-3102-041	Front panel with 4 × LEMO input connectors and 1 × BNC output (for Type 3677 only)
Type 3660-A-20x†	Wireless LAN Frame
ZG-0858	DC Power Charger, car utility connector to Type 2831-A
AO-0546	DC Power Cable, car utility connector to single module

* x = D (decimetres) or M (metres); yyy = length in decimetres or metres. Please specify cable length when ordering

† Where x = 0 or 1. Type 3660-A-200 is for international use (except Japan), Type 3660-A-201 is for use in Japan only.

SENSORS

A wide range of Brüel & Kjær accelerometers, microphones, preamplifiers and sound intensity probes is available for use with a LAN-XI-based systems. The system supports IEEE 1451.4-capable transducers with standardized TEDS. Visit bksv.com/transducers for more information

SOFTWARE

BK Connect software applications and applets support the entire LAN-XI platform, including LAN-XI Light. See the individual product data for limitations and requirements. For more information on this software platform, visit bksv.com/bkconnect.

Sonoscout NVH Recorder BZ-5950 supports selected products in the LAN-XI platform, including LAN-XI Light. See product data BP 2463 for details.

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