PRODUCT DATA

3-ch. Input Module LAN-XI 102.4 kHz Type 3052

Specifically designed to measure high-frequency (>50 kHz) sound and vibration signals, Type 3052 has three input channels with a frequency range from DC to 102.4 kHz. Combined with a dynamic range of 160 dB, this ensures that demanding measurement needs can be met, while interchangeable front panels give the flexibility to use a wide range of transducers.

Type 3052 works equally well as a single-module data acquisition system where only a few input channels are required, or as one part of a large LAN-XI measurement system.

Uses and Features

Uses

- High-frequency sound and vibration measurements
- Measurement front-end module for PULSE™ measurement and analysis software
- Front-end for PC-based Data Recorder Type 7708
- Single-module measurements
- Multi-module measurements/distributed system
- Stand-alone recording (no PC) using LAN-XI Notar™ software

Features

- 3 input channels
- DC to 102.4 kHz input range
- 262 ksamples/s sampling rate
- Power for 200 V microphones
- Dyn-X technology
- REq-X technology
- Supports TEDS transducers
- Interchangeable front panels

One Cable Operation

You can use standard LAN cables for synchronous sampling between modules and system power, thanks to Power over Ethernet (PoE). This minimises the number of cables required and results in lower cost, less downtime, easier maintenance, and greater flexibility of installation.

Power over Ethernet

PoE is implemented according to IEEE 802.3af. PoE is wired Ethernet LAN technology that, with a suitable PoE LAN switch, allows the power needed for each module to be carried by screened shielded twisted pair (S/STP or S/FTP) CAT6 LAN cables rather than by separate power cables. This minimises the number of cables required and results in lower cost, less downtime, easier maintenance and greater installation flexibility. PoE switches, such as 10-port Gigabit Managed Switch with PTP and PoE (8 ports) UL-0265, and PoE Injectors, such as ZyXEL® PoE-12 Power over Ethernet (a single-port PoE injector), can be used.

Built for Field and Lab Use

The modules and the detachable front plates are cast in magnesium for maximum stability, light weight, and tough field use.

Interchangeable Front Panels

The modules allow front panels to be interchanged freely, with a variety of connectors for different transducers and applications. This results in fewer patch panels, less cable “spaghetti”, fewer cable adaptors and faster system setup.

Independent Channels

The input channels on a module can be set up independently. You can set up the high-pass filters and input gain separately and attach different types of transducer to different channels.

IEEE 1451.4 Transducers

All input modules support TEDS transducers. This allows automatic front-end and analyzer setup based on TEDS information stored in the transducer, for example, sensitivity, serial number, manufacturer and calibration date. The individual frequency response of a transducer can be corrected for using PULSE’s Transducer Response Equalisation, REq-X, to achieve higher accuracy over extended frequency ranges.

Overload

Constant Current Line Drive (CCLD) conditioning monitors the supply voltage used by CCLD-compatible transducers. Available CCLD transducers include:

- Accelerometers
- Charge amplifiers
- Microphone preamplifiers
- Tacho probes

If conditioning errors, such as a broken cable, are detected, an error is indicated as an overload on the specific channel connector (using a ring-LED around the connector) and in the PC software.

Overload indications for input channels include (see Specifications for details):

- Signal overload with adjustable detection level
- CCLD overload: detection of cable break, short-circuit or CCLD transducer working point fault
- Microphone preamplifier overload: detection of microphone preamplifier current consumption too high or too low
- Common mode voltage overload – relevant when input coupling is floating

Ground-loop Noise Suppression

The module’s floating/grounded, differential input design and the fact that all external connections (LAN, power supply) are galvanically isolated in the module provide optimal ground-loop noise suppression.

Compliance with Standards

	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive 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 61000–6–3: Generic emission standard for residential, commercial, and light-industrial environments CISPR 22: 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 Product Data
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

EFFECT OF RADIATED AND CONDUCTED RF, MAGNETIC FIELD AND VIBRATION
Radiated RF: 80–2700 MHz, 80% AM 1 kHz, 10 V/m
Conducted RF: 0.15–80 MHz, 80% AM 1 kHz, 10 V
Magnetic Field: 30 A/m, 50 Hz
Vibration: 5–500 Hz, 12.7 mm, 15 m/s^2
Input measured with shorted input. All values are RMS. Conducted RF immunity on all channels is only guaranteed using an external connection from measuring ground to chassis terminal

Input	Radiated RF	Conducted RF	Magnetic Field	Vibration
Direct/CCLD	<250 µV	<300 µV	<4 µV	<80 µV
Preamplifier	<250 µV	<50 µV	<8 µV	<80 µV

Specifications – LAN Interface

CONNECTOR
RJ 45 (10baseT/100baseTX) connector complying with IEEE–802.3 100baseX
Types 3660-C and -D permit the use of a ruggedized RJ45 data connector (Neutrik NE8MC-1) to screw the cable to the frame
Types 3660-C and -D communicate at 1000 Mbits/s: shielded cables of type "CAT 5e" or better should be used
Individual modules communicate at 100 Mbits/s
All LAN connectors support MDIX, which means that cables may be "crossed" or not
For stand-alone modules, PoE is also supported (IEEE 802.3af). PoE requires screened shielded twisted pair (S/STP or S/FTP) CAT6 LAN cables

PROTOCOL
The following standard protocols are used:
- TCP
- DHCP (incl. Auto-IP)
- DNS (on top of UDP)
- IEEE 1588–2002 (on top of UDP)
- IP
- Ethernet

ACQUISITION PERFORMANCE
Each LAN-XI module generates data at almost 20 Mbit/s when measuring three channels at 102.4 kHz bandwidth. The modules are capable of handling their own maximum traffic while the built-in switch in the frame's backplane has more than sufficient capacity. This means that bottlenecks can only occur outside these, for example in:
- External switches
- PC

For convenience, it is possible to daisy-chain LAN-XI frames. However, it is not recommended to daisy-chain more than two frames. For larger configurations, a star configuration with a central switch is recommended. This must have a switch capacity well beyond $N \times 20$ Mbit/s, where N is the total number of modules

PTP PERFORMANCE
PTP Synchronisation (with 1 Gigabit LAN Switch):
Typical sample synchronisation better that 200 ns
(approx. ±0.07° @ 1 kHz, ±2° @ 25.6 kHz)
Tested with:
- Cisco® SG300-10MP, 10-port 10/100/1000 Managed Gigabit Switch with Maximum PoE (8 ports)
- Netgear® 5-port Gigabit Switch GS105

Better performance can be expected with a dedicated PTP switch:
- UL-0265: 10-port Gigabit Managed Switch with PTPv2 and PoE (8 ports).
  This is a dedicated PTP switch, preconfigured for optimal use with LAN-XI

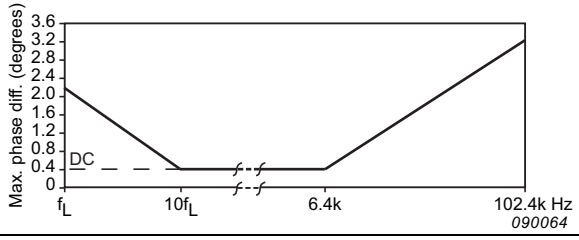
Specifications – 3-ch. Input Module LAN-XI 102.4 kHz Type 3052

POWER REQUIREMENTS
DC Input: 10–32 V DC
Connector: LEMO coax., FFA.00.113, ground on shield
Power Consumption:
DC Input: <15 W
Supply via PoE: According to IEEE 802.3af, Max. cable length 50 m
Temperature Protection:
Temperature sensor limits module's internal temperature to 80ºC (176ºF). If temperature exceeds limit, system will automatically enable fan in LAN-XI frame or shut down module outside frame

DIMENSIONS AND WEIGHT
Height: 132.6 mm (5.22″)
Width: 27.5 mm (1.08″)
Depth: 250 mm (9.84″)
Weight: 750 g (1.65 lb)

Frequency Range		DC to 102.4 kHz Lower frequency range can be set in PULSE software			
Sampling Rate		262 ksamples/s			
A/D Conversion		2 × 24 bit			
Data Transfer		24 bit			
Input Voltage Range		10 V_{peak} Extended range: 31.6 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, Microphone: 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 in 10 V_{peak} range ** Defined as the nominal –10%/3 dB filter frequency		**– 0.1 dB ***	**–10% @ ****	**–3 dB @ ****	**Slope**
	0.1 Hz –10% analog high-pass filter 0.7 Hz –0.1 dB digital high-pass filter	0.5 Hz 0.7 Hz	0.1 Hz 0.15 Hz	0.05 Hz 0.073 Hz	–20 dB/dec.
	1 Hz –10% digital high-pass filter 7 Hz –0.1 dB digital high-pass filter	5 Hz 7 Hz	1.0 Hz 1.45 Hz	0.5 Hz 0.707 Hz	–20 dB/dec.
	22.4 Hz –0.1 dB analog high-pass filter	22.4 Hz	15.8 Hz	12.5Hz	–60 dB/dec.
	Intensity filter (analog)	115Hz	23.00 Hz	11.5 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 80 dB below full scale	±0.05 dB, typ. ±0.01 dB			
	80 to 100 dB below full scale	±0.2 dB, typ. ±0.02 dB			
	100 to 120 dB below full scale	typ. ±0.02 dB			
	120 to 140 dB below full scale	typ. ±0.02 dB			
	140 to 160 dB below full scale	typ. ±1 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 in 10 V_{peak} range (see under High-pass Filters) f_u is defined as the chosen frequency span. DC (f_L = 0)		±0.1 dB ±0.3 dB in 31.6 V range			

Noise		**Input Range**	**Guaranteed**		**Typical**	
			Lin*	**1 kHz**	**Lin***	**1 kHz**
* Measured lin. 10 Hz to 51.2 kHz or lin. 10 Hz to 102.4 kHz: (Input terminated by 50 Ω or less)	**Signal level <316 mV_{peak}** 10 Hz to 25.6 kHz 10 Hz to 51.2 kHz 10 Hz to 102.4 kHz	10 V_{peak}	<4 μV_{rms} <6 μV_{rms} <8 μV_{rms}	<25 $nV_{rms}/\sqrt{Hz}$	<3 μV_{rms} <4.5 μV_{rms} <6 μV_{rms}	<19 $nV_{rms}/\sqrt{Hz}$
	Signal level >316 mV_{peak} 10 Hz to 25.6 kHz 10 Hz to 51.2 kHz 10 Hz to 102.4 kHz	10 V_{peak}	<60 μV_{rms} <85 μV_{rms} <120 μV_{rms}	<375 $nV_{rms}/\sqrt{Hz}$	<50 μV_{rms} <71 μV_{rms} <100 μV_{rms}	<313 $nV_{rms}/\sqrt{Hz}$
	Signal level <1 V_{peak} 10 Hz to 25.6 kHz 10 Hz to 51.2 kHz 10 Hz to 102.4 kHz	31.6 V_{peak}	<20 μV_{rms} <29 μV_{rms} <40 μV_{rms}	<125 $nV_{rms}/\sqrt{Hz}$	<15 μV_{rms} <22 μV_{rms} <30 μV_{rms}	<95 $nV_{rms}/\sqrt{Hz}$
	Signal level >1V_{peak} 10 Hz to 25.6 kHz 10 Hz to 51.2 kHz 10 Hz to 102.4 kHz	31.6 V_{peak}	<200 μV_{rms} <285 μV_{rms} <400 μV_{rms}	<1250 $nV_{rms}/\sqrt{Hz}$	<150 μV_{rms} <215 μV_{rms} <300 μV_{rms}	<950 $nV_{rms}/\sqrt{Hz}$

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 largest spurious spectral component (non-harmonic)	**Input Range**	**Typical**	
	10 V_{peak}	160 dB	
	31.6 V_{peak}	140 dB	
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**
		<−60 dB	−80 dB
Harmonic Distortion (all harmonics)		**Guaranteed**	**Typical**
		−80 dB (−60 dB in 31.6 V range)	−100 dB @ 1 kHz (−80 dB @ 1 kHz in 31.6 V range)
Crosstalk: Between any two channels of a module or between any two channels in different modules		**Frequency Range**	**Guaranteed** / **Typical**
		0 – 102.4 kHz	−100 dB / −140 dB
Channel-to-Channel Match		**Guaranteed**	**Typical**
(10 V_{peak} input range) — Maximum Gain Difference f_L is defined as the −0.1 dB frequency of the high-pass filter		0.1 dB from lower frequency limit, f_L, to 102.4 kHz (0.4 dB at −10% filter frequency)	±0.01 dB
Maximum Phase Difference (within one frame) f_L is defined as the −0.1 dB frequency of the high-pass filter			
Additional PTP sync. error (phase difference) between modules/frames (using a single standard gigabit switch)		**Typical:** <200 ns (approx. ±0.07° @ 1 kHz, ±2° @ 25.6 kHz)	
Channel-to-Channel Match (31.6 V_{peak} input range) — Maximum Gain Difference		0.6 dB from lower frequency limit, f_L, to 102.4 kHz (1 dB at −10% filter frequency)	
Maximum Phase Difference (within one frame)		4° from lower frequency limit, f_L, to 102.4 kHz	
Sound Intensity Phase Match (only for using intensity filter and in 10 V_{peak} input range) All channels matched	**Frequency Range**	**Guaranteed Phase Match**	**Typical Phase Match**
	50 – 250 Hz	±0.017°	±0.005°
	250 Hz – 2.5 kHz	0.017° × (f/250)	±0.005°
	2.5 – 6.4 kHz	±0.17°	±0.08°
Common Mode Rejection in 10 V_{peak} input range Values for 31.6 V_{peak} range are 10 dB lower.		**Guaranteed**	**Typical**
	0 – 120 Hz	70 dB	80 dB
	120 Hz – 1 kHz	55 dB	60 dB
	1 – 51.2 kHz	30 dB	40 dB
	51.2 – 102.4 kHz	30 dB	40 dB
Absolute Max. Common Mode Voltage		±5 V_{peak} without damage	
		±4 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. Max. 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 which can cause aliasing	Filter Type	3rd order Butterworth	
	−0.1 dB @	102.4 kHz	
	−3 dB @	256 kHz	
	Slope	−18 dB/octave	
Supply for Microphone Preamplifiers		±14.0 V, max. 100 mA per channel (max. 100 mA total/module)	
Supply for Microphone Polarization		200 V ±1 V, or 0 V (Set per channel)	
Supply for CCLD		4 to 5 mA from 24 V source, option to DC-couple CCLD power supply	
Tacho Supply		CCLD for Type 2981 (Power supply for legacy types MM-0012 and MM-0024 not available)	
Analog Special Functions	**Microphone Charge Injection Calibration:** All modules with 7-pin LEMO support CIC via dedicated application software and OLE interface **Transducers:** Supports IEEE 1451.4-capable transducers with standardised TEDS (up to 100 m (328 ft) cable length)		

Overload Detection	**Signal Overload:** Adjustable detection level ±1 V_{peak} to ±10 V_{peak}. Default level ±10 V_{peak} (CCLD mode ±7 V_{peak}) (31.6 V range: ±31.6 V) can be set in PULSE Transducer Database **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 10 mA/1 mA Adjustable detection level 1 to 20 mA or 100 mA if disabled **Common Mode Voltage Overload:** Detection level: ±3.0 V
Protection	If signal input level exceeds the measuring range significantly, the input will go into protection mode until the signal goes below the detection level again for at least 0.5 s. While in protection mode, the input is partly switched off and the input impedance is greatly increased. (The measured value will be strongly attenuated but still detectable) In DC mode –10 V_{peak} range, the detection limit is ±12 V. In all other measuring modes (except CCLD) the limit is ±50 V_{peak} including DC component or ±12 V_{peak} AC (In CCLD mode the limit is +50/–2 V_{peak} including DC component or ±12 V_{peak} AC) In the 31.6 V range, the limit is ±50 V_{peak}

Ordering Information

Type 3052-A-030 3-ch. Input Module LAN-XI 102.4 kHz (Mic, CCLD, V) includes the following accessories:

- UA-2100-030: LAN-XI Detachable front panel with 3 BNC input connectors
- ZG-0426: Mains Adaptor (100 – 240 V)
- AO-1450: Shielded CAT 6 LAN Cable with RJ 45 (2 m)

OPTIONAL ACCESSORIES

AO-0090	7-pin LEMO to BNC male (1.2 m) for floating ground
AO-0091	7-pin LEMO to BNC female (1.2 m) for floating ground
AO-0526	4-pin Microtech to 3 × BNC Cable
AO-0546	DC Power Cable, Car Utility Socket to 1 module
AO-0548	DC Power Cable, Source to 4 modules
AO-1450	Shielded CAT 6 LAN Cable with RJ45 (2 m)
JJ-0081	BNC Adaptor, female to female
JJ-0152	BNC T-connector
JP-0145	BNC to 10–32 UNF Plug Adaptor
UA-1713	10 × 2 mm Hex Wrench (QX-1315) for front panel exchange
UL-0265	10-port Gigabit Managed Switch with PTP and PoE (8 ports)
WB-1497	20 dB Attenuator

SOFTWARE

Please refer to the System Data for PULSE Software (BU 0229)

Service Products

3052-CAI	Type 3052 Initial Accredited Calibration
3052-CAF	Type 3052 Accredited Calibration
3052-CTF	Type 3052 Traceable Calibration
3052-TCF	Type 3052 LAN-XI Conformance Test with Certificate

A wide range of Brüel & Kjær Accelerometers, Microphones, Preamplifiers and Sound Intensity Probes is available for use with a LAN-XI system. The system supports IEEE 1451.4-capable transducers with standardised TEDS

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TRADEMARKS

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