PRODUCT DATA

NEXUS Conditioning Amplifers for Very High Input — Types 2692C and 2692D

NEXUS™ Conditioning Amplifiers are equally suited for laboratory and field use. They are compact and self-contained with an optional rechargeable battery. They are lightweight too, weighing around 3 kg (6.6 lb.), including battery. Rack-mounting fittings are available for in-vehicle testing purposes as well as for stationary use.

USES

- Specially suitable for applications where shocks and impulses occur such as gas turbine testing and munitions testing
- General signal conditioning amplifiers for use with charge accelerometers, hydrophones and force transducers

BENEFITS

- Compact robust design and battery operation make the conditioning amplifiers suitable for use in the field (and in the laboratory)
- Serial control interface (RS–232) allows computer control of setups and test functions. A large number of amplifiers can be controlled from a single PC
- Built-in, patented Mounted Resonance Testing
- Wide range of filters that can be set up for specific tasks
- Rack-mounting fittings available

Charge Channels

NEXUS Conditioning Amplifier Types 2692 C and 2692 D are designed for applications where very high charge inputs (up to 100 nC) can occur. They contain four charge channels. Each channel has comprehensive high- and low-pass filtering facilities. TNC input connectors are used and TNC to 10–32 UNF (microdot) adaptors are provided. Input can be single- ended or floating.

The patented Mounted Resonance Testing facility is available on each channel. It is very useful for obtaining information about the mounting of the associated charge accelerometer and general errors in the measurement setup.

Reliable Design

Since all NEXUS amplifiers are built for both indoor and portable outdoor use, they meet strict requirements for temperature and humidity. The operating temperature range extends from –10 to 55°C (14 to 131°F). The instrument will withstand rain if kept with the front panel facing upwards. However, because of the sockets on the back panel, it is not watertight.

Reference and Test Generators

A reference generator is included in the hardware and can be used as an excitation signal for your measurement setup. The output signal is sinusoidal at 159.2 Hz (±1%) with a level of 1 V RMS. A 159.2 Hz (±1%) sinusoidal test tone is also available. It is applied in parallel with the charge input signal. The level depends on the selected output sensitivities.

Built-in Filters

A number of filters are provided with NEXUS. The filters are low-pass filters with –1 dB (–10%) cut-off frequencies of 0.1, 1, 3, 10, 22.4, 30 and 100 kHz (40 dB/decade, 2-pole) and –1 dB (–10%) high-pass filters with 0.1, 1, 10 and 20 Hz cut-off frequencies (10, 20 Hz/ 80 dB/decade).

Computer Control

Serial RS–232 Interface

All functions can be controlled via the serial RS–232 interface. It is possible to switch the power on or off via the RS–232.

Controlling Several Amplifiers

You can “daisy-chain” up to 99 channels. Each unit can be automatically addressed from an optional PC-program. Examples of control using LabVIEW™ driver and Visual Basic® are available as free downloads from National Instruments and Brüel & Kjær websites.

NEXUS Setup and Control Software Type 7749

Type 7749 is a PC-based software package for setup and control of the NEXUS range of conditioning amplifiers and runs under Windows®. The software automatically detects IEEE P1451.4 capable transducers with standardised Transducer Electronic Data Sheets.

Compliance with Standards

CE C-Tick	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive. C-Tick mark indicates compliance with the EMC requirements of Australia and New Zealand.
Safety (Low voltage Directive)	EN 61010–1 and IEC 61010–1: Safety requirements for electrical equipment for measurement, control and laboratory use. UL 3111–1: Electrical Measuring and Test Equipment (Underwriter's Laboratories, USA).
EMC Emission (EMC Directive)	EN 50081–1 and IEC 61000–6–3: Generic emission standard. Part 1: Residential, commercial and light industry. EN 50081–2 and IEC 61000–6–4: Generic emission standard. Part 2: Industrial environment. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Rules, Part 15: Complies with the limits for a Class B digital device.
EMC Immunity (EMC Directive)	EN 50082–1 and IEC 61000–6–1: Generic immunity standard. Part 1: Residential, commercial and light industry. EN 50082–2 and IEC 61000–6–2: Generic immunity standard. Part 2: Industrial environment. ISO 7637–1, 7637–2 and 7637–3: Road Vehicles – Electrical Disturbance by Conduction and Coupling. **Note 1:** Refer to "Environmental Susceptibility" in specifications. **Note 2:** The above is guaranteed using the accessories in this Product Data only.
Temperature	IEC 60068–2–1 & IEC 60068–2–2: Environmental Testing. Cold and Dry Heat. Operating Temperature: –10 to +55 °C (14 to 131 °F) Storage Temperature: –25 to +70 °C (–13 to 158 °F) IEC 60068–2–14: Change of Temperature: –10 to +55 °C (2 cycles, 1 °C/min.)
Humidity	IEC 60068–2–3: Damp Heat: 90% RH (non-condensing at 40 °C (104 °F))
Mechanical	Operating (peak values) MIL–STD – 810C: Vibration: 12.7 mm, 15 m/s^2, 5 – 500 Hz Non-operating: IEC 60068–2–6: Vibration: 0.3 mm, 20 m/s^2, 10–500 Hz IEC 60068–2–27: Shock: 1000 m/s^2 IEC 60068–2–29: Bump: 1000 bumps at 250 m/s^2
Enclosure	IEC 60529 (1989): Protection provided by enclosures: IP43

Specifications – Types 2692C and 2692D

Charge Input

CONNECTOR: TNC (TNC to 10–32 UNF adaptor JP 0162 included)
GROUNDING: Single-ended or floating
MAX. INPUT:
Differential Charge: 100 nC (peak)
Common Mode Voltage: 4.2 V (peak) At gain ≥ 0.316 mV/pC (–10 dB gain with 1 nF transducer capacitance)
INPUT PROTECTION:
Differential Charge: ≤300 nC (peak)
Common Mode Voltage: ≤15 V (peak)
COMMON MODE REJECTION RATIO: >50 dB (typical) (50 to 60 Hz with 1 nF transducer capacitance)
AMPLIFIER GAIN: 0.01 mV/pC to 10 V/pC (–40 to +80 dB gain with 1 nF transducer capacity)
ACCEPTABLE TRANSDUCER SENSITIVITY RANGE: 10^{-19} to 10^{-6} C/MU (MU = mechanical units: m/s^2; g, N, lb., Pa)
CALIBRATED OUTPUT: Selectable in 10 dB steps. 120 dB attenuator range, 10^{-16} to 10^{7} V/MU
±1% for 0°C ≤ T_a ≤ +40°C and ±2% for –10°C ≤ T_a ≤ +55°C
Frequency range from $5 \times f_l$ to $0.2 \times f_u$
f_l = lower freq. limit: 0.1, 1.0 or 10 Hz
f_u = upper freq. limit: 0.1, 1, 3, 10, 30 or 100 kHz
FREQUENCY RANGE (–10%):
Acceleration: 0.1 Hz to 100 kHz (transducer cable length <10 m)
Velocity (optional): 1.0 Hz to 10 kHz
Displacement (optional): 1.0 Hz to 1 kHz
LOW-PASS FILTER (–10%): 0.1, 1, 3, 10, 22.4, 30 or 100 kHz, attenuation slope 40 dB/decade
HIGH-PASS FILTER (–10%):
Acceleration: 0.1, 1.0 or 20 Hz
Velocity (optional): 1.0 or 10 Hz
Displacement (optional): 1.0 or 10 Hz
INHERENT NOISE (2 Hz to 22.4 kHz):
<5 fC referred to input, –10°C ≤ Ta ≤ +40°C
<10 fC referred to input, +40°C ≤ Ta ≤ +55°C
(amplifier sensitivity (>20 dB) with 1 nF transducer capacitance)
HARMONIC DISTORTION AND NOISE (2 Hz to 22.4 kHz, Q_{in} ≤20 nC peak, V_{out} ≤3.16 V peak): <0.003% for amplifier gain ≤0.1 V/pC (<40 dB gain with 1 nF transducer capacitance)
ENVIRONMENTAL SUSCEPTIBILITY (referred to input):
Magnetic Field: <0.2 fC/(A/m)
Electromagnetic Field: <20 fC/(V/m) or <4 fC/V
Vibration (10 to 500 Hz): <30 fC/(m/s^2)
MOUNTED RESONANCE TESTING[1]: EP Patent 715.722, US Patent 5.753.793
Mounted resonance testing of the accelerometer and cable interconnection, controllable from front panel and RS–232 interface
TEST TONE OSCILLATOR: ω = 1000 rad/s (159.2 Hz), sinusoidal
Test Level: 1 mV to 10 V (±1%). Controllable from front panel and RS–232 interface
REFERENCE TONE: 1 V (RMS), (±1%), 159.2 Hz
RISE TIME: >7.5 V/μs (100 kHz bandwidth)
CHANNEL TO CHANNEL PHASE-MATCH:
$2.1° - 0.1° \times (f/f_l)$ from f_l to $20 \times f_l$
0.1° from $20 \times f_l$ to $0.1 \times f_u$
$(f/f_u)°$ from $0.1(f_u)$ to f_u
f_l: lower freq. limit: 10 Hz
f_u: upper freq. limit: 0.1, 1, 3, 10, 30 or 100 kHz
FILTERS:
2692 D: Single and double integration filters included
2692 C: Single and double integration filters optional

1. Brüel & Kjær patent

Power Supply

INTERNAL BATTERY (not included):
Nickel-Metal Hydride rechargeable battery supporting SMBus and on-battery charge level meter. Provides typically 15 hours of continuous use with a single channel and 4 hours with four channels without backlighting and without optional filters. With backlighting on, and with optional filters, battery provides typically 3 hours of continuous use. If NEXUS is not used for more than a month, please remove the battery to prevent discharging. Charging time is approximately 4 hours
EXTERNAL DC POWER INPUT:
Complies with ISO 7637–1 (12 V) and 7637–2 (24 V)
Input Range: 10 to 33 V DC
MAINS SUPPLY: Supported via Mains Adaptor ZG 0426 (included), 90–264 V AC, 40–65 Hz

Digital Control Interface

SERIAL INTERFACE: Conforms to EIA/TIA-574 (RS–232)
Baud rate: 2400, 4800, 9600
Parity: None
Data Bits: 8
Stop Bits: 1
Handshake: X-on/X-off
"Plug and play" interface coupling
Communication speed for a baud rate of 9600: Transmission time for one command of 5 characters is ~ 4 ms
Transmission time for one command of 5 characters and to receive an echo after each character is ~ 8 ms
Execution time for one command is 100 ms to several seconds
Time to configure a complete 4-channel NEXUS using short form set-up with approx. 600 characters requires transmission time of 2 to 3 s (4 to 6 s with echo after each character)
Execution time in NEXUS is from 40 to 60 s
For setups with over 1000 characters, the transmission time will be increased by at least 30 s due to delay in emptying receiver buffer
Response time after requesting a status of one load: < 0.5 s
Response time after requesting a peak meter reading: < 0.5 s

Display Interface

DISPLAY: 64 × 128 pixel graphical display with back-lighting on/off
OVERLOAD DETECTION: On both common-mode and differential signals applied before filters. LED overload indication at the front panel and overload indication via RS–232 control interface

Peak Meter

DYNAMIC RANGE: –30 to +10 dBV (peak)
RESOLUTION: 1 dB

Analogue Output

CONNECTOR: BNC
GROUNDING: Single-ended or floating
OUTPUT IMPEDANCE: = 50 Ω//500 pF
MAX. OUTPUT (differential voltage): 10 V peak (20 V peak to peak)
MAX. DC OFFSET: ± 25 mV, typically < 2 mV
OUTPUT PROTECTION:
Differential Voltage: ≤50 V (peak)
Common Mode Voltage: ≤15 (peak)
Common Mode Rejection: >50 dB (50 to 60 Hz) for Common Mode Voltage ≤2 V peak (voltage injected into instrument)
OUTPUT DRIVE CAPACITY: 100 m of cable (100 pF/m) to 20 kHz
1000 m of cable (100 pF/m) to 2 kHz
CHANNEL SEPARATION: better than –100 dB at 1 kHz

Dimensions and Weight

Height: 90 mm (3.5″)
Width: 144 mm (5.7″)
Depth: 230 mm (9.1″)
Weight: Approx. 3 kg (6.6 lb.), for a 4-channel unit including battery

Note: All values are typical at 25°C (77°F), unless measurement uncertainty is specified. All uncertainty values are specified at 2σ (i.e., expanded uncertainty using a coverage factor of 2)

Calibration

NEXUS amplifiers are supplied with a Manufacturer's Certificate of Conformance. An initial calibration can be supplied as an option. The calibration services in the table below are based on one channel. There is an extra charge for each additional channel:

Type	Initial Calibration	Recalibration
2692 C	2692 C	2692 C

All other accessories are listed in the associated ordering information sheet (BA 0287).

Ordering Information

Types 2269 C and 2269 D Conditioning Amplifiers include the following accessories:
ZG 0426: Mains Adaptor, 90–264 V AC
LK 0013: Ferrite Cable Clamp

Optional Accessories

Type 7749	NEXUS Setup and Control Software
AO 0537	7-pin Brüel & Kjær mic. plug to 7-pin LEMO Adaptor cable for split mic. supply
AO 1440	RS–232 Interface Cable
AO 0546	Supply Cable with cigarette lighter to LEMO connector (3 m)
AO 0547	Supply Cable with cigarette lighter to spade terminals (3 m)
AO 0548	Branched Supply Cable, spade terminals to 4 LEMO connectors (1.5 m)
BZ 5294	TEDS Editor
BZ 5294 MS4	Calibration License
BZ 5294 MS5	Developer's License
UA 2020 MS4	Calibration Kit
UA 2020 MS5	Developer's Kit
KK 0049	Combination Frame (19″ rack). Holds up to 3 NEXUS units
KQ 0158	19″ Portable Rack. Holds up to 9 NEXUS units or 8 NEXUS units and a power supply WB 1436
QB 0048	Nickel-Metal Hydride Rechargeable Battery DR35
ZE 0794	A-, B-, C- and D-weighting filters
ZE 0788	Integration, single and double – contact Brüel & Kjær for a configured system
UA 1409	Frame for SONY® DAT Series 200 recorder Holds up to 4 NEXUS units
UA 1482	Frame for SONY® SIR-1000. Holds 1 or 2 NEXUS units
UA 2019	Interface Adaptor
WH 3219	Upper Limiting Frequency 140 kHz
WH 3206	Whole Body Vibration X, Y and Z Direction Filter according to ISO 2632–1
WH 3278	900 Hz to 1100 Hz Band Pass Filter
WH 3345	Constant Power On
WB 1436	32-ch. Power Supply (90–264 V)
WL 1218	Adaptor for 2 × 7-pin intensity probe: LEMO connectors to 18-pin LEMO connector
ZG 0405	Battery Charger (separate)

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

BP 1976–11 02/09 Rosendahls Bogtrykkeri

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