Product Data

Measuring Amplifier — Type 2525

USES:

- ❍ Manual and automated measurements of vibration levels
- ❍ General R & D vibration measurements
- ❍ Test cell monitoring
- ❍ Production quality control

FEATURES:

- ❍ IEEE–488 and serial interfaces
- ❍ Charge and DeltaTron® inputs
- ❍ Signal integration for displacement and velocity
- ❍ Selectable low- and high-pass filters
- ❍ Possibility for user-defined filters
- ❍ Connector for external filters
- ❍ RMS, +peak, –peak, peak-to-peak meter function with read-out in metric or imperial units
- ❍ Autorange function on gain
- ❍ Mounted resonance read-out for transducers
- ❍ Level monitoring with alarm output
- ❍ Detector DC output
- ❍ Wide dynamic range: 100 dB

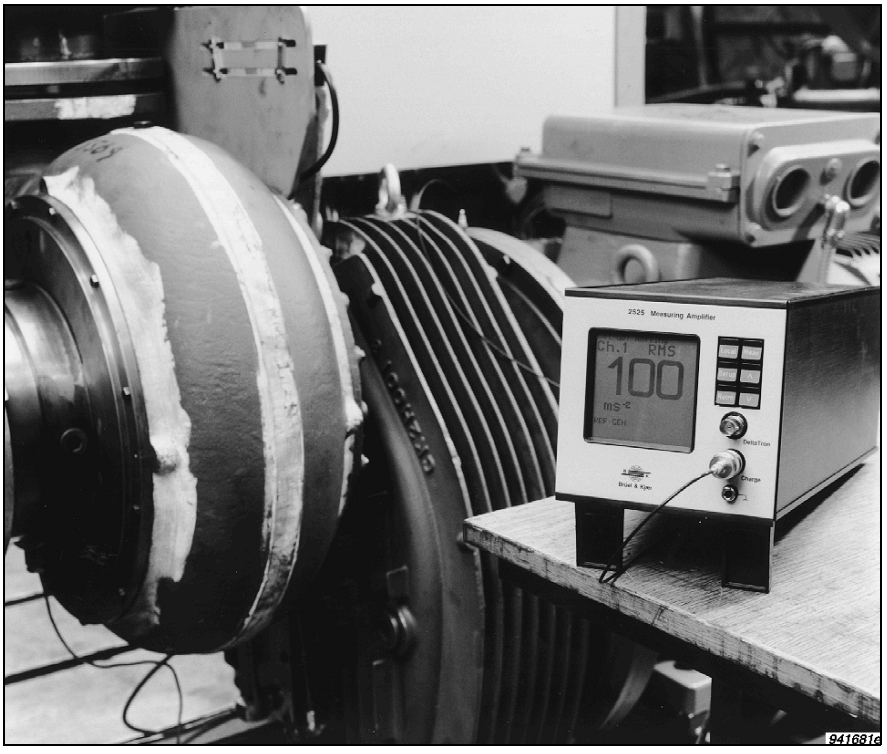
The Measuring Amplifier Type 2525 is a low-noise amplifier featuring both Charge and DeltaTron® inputs, an extended menu-based user-interface for local control and the option of remote, automated control from one of its two interfaces.

The measuring amplifier is well-suited to both product and prototype testing and includes automatic gain adjustment, level monitoring with alarm output and signal overload indication. In addition, the amplifier includes a mounted resonance measuring function for ensuring the best mounting of accelerometers.

An integrator can convert acceleration signals to velocity and displacement and the gain adjustment features ensure rapid and accurate set-up and ease of interpretation.

Up to eight amplifier set-ups can be stored and recalled, providing, with the interfaces, a platform for fully automatic operation.

In addition to the built-in filters, a 15-pin auxiliary connector is provided for external filter attachment. Additional internal filters can be added upon request.



General

The Measuring Amplifier Type 2525 is a 1-channel low-noise general-purpose measurement amplifier with both charge and DeltaTron™ inputs.

The amplifier has a built-in screen for viewing measurement data as well as for selecting set-up and measurement parameters (see Fig. 1). Measurement data can be viewed in three different formats: full-screen featuring measurement values and a bar graph, large format digits alone, and a digits and select options allowing viewing of measurement results simultaneously with set-up and parameter adjustment.

The two interface connections on the amplifier's rear panel (see Fig. 2) are for connection via IEEE – 488 or serial interface.

Main Features

The Measuring Amplifier Type 2525 includes a number of features which allow sophisticated and automatic measurement configuration as well as display set-up options which can be selected to best reflect the current application.

Measurement Set-up

The measurement set-up consists of twelve menus which carry out (or lead to sub-menus which carry out) the following functions:

- Measurement mode selection: acceleration, velocity displacement or force
- Transducer sensitivity
- Input type: DeltaTron® or Charge (floating or grounded)
- Input, output and fine gain select
- Upper frequency limit
- Lower frequency limit
- Additional filter: internal or external
- RMS averaging: exponential or linear plus selectable averaging time
- Peak hold time
- Autorange (automatic gain adjustment)
- Alarm On/Off, detector (RMS or peak), level, hold time and level exceed time
- Detector DC output

Display Set-up

Measurement results can be displayed in terms of RMS, positive or negative peak values, or peak-to-peak.

Read-out value scales are selectable as either absolute (with physical units shown) or dB. Bar graphs are shown with absolute values on a logarithmic axis. Units can be specified as metric or imperial.

Measurement values can be read-out in scientific notation (floating) or as fixed-point values (attenuator dependent).

The Set-up Mode menu allows you to specify a full screen display which includes a bar graph of the current measurement as well as the instantaneous measurement value, or the values only. It is possible to make changes to the set-up while viewing their effect on the measurement values.

General Set-up Features

In addition to the measurement and display set-up features, a number of general options can be selected:

Fig.1 Measuring Amplifier Type 2525 front panel. The axes are not labelled as the display is intended as a visual monitor only

Fig.2 Measuring Amplifier Type 2525 rear panel

- Select impulse frequency and read-out mounted resonance frequency
- Sine reference for sensitivity check
- Recall or store user-defined set-up, or recall factory set-up
- Interface set-up: IEEE–488 address, serial baud rate, handshake, hardwired, modem
- Back-lighting On/Off

Interface Control

Under the control of an external computing device via one of its two interfaces, the amplifier's extensive measurement and display features can be automated, allowing full integration in a production line and automated test environment.

All features provided by the menus under manual control (except the specification of the interfaces themselves) are also available via interface.

In addition, interface control provides some extra features with respect to resetting entire set-ups or individual components, error handling, and measurement and operation monitoring and control.

Product and Prototype Testing

Aside from its sophisticated functionality and possibilities for automated control, the Measuring Amplifier Type 2525 offers two main features which make it a must in the measurement chain of any automated product test procedure:

- ❍ Autorange (autogain)
- ❍ Alarm monitoring function

The autorange function makes setting up the amplifier easy in cases where you have little information regarding the vibration levels the measurement source can achieve.

The alarm monitoring function makes it possible to select a monitoring level using RMS, positive or negative peak values or peak-to-peak. By specifying a level exceed time, an acceptable margin (e.g. noise margin) can be defined. The alarm hold time ensures that levels are held long enough to be discovered.

Specifications 2525

CHARGE INPUT:
Floating or grounded via TNC socket on front
Max. Input 0 to 100 kHz: 50 nC peak
Max. Common Mode Voltage on Floating Input: 5 V peak at charge input level max. 10 nC peak
Common Mode Rejection Ratio (CMRR):
With input gain +20 to +60 dB:
100 Hz CMRR >60 dB
10 kHz CMRR >45 dB
With input gain –20 to +10 dB:
100 Hz CMRR >50 dB
10 kHz CMRR >40 dB
Total Sensitivity:
0.1 pC to 10 nC in steps of 10 dB for 1 V on AC output
0.03 pC to 10 nC in steps of 0.01 dB step for 1 V on AC output, with reduced frequency range
Gain:
Input Gain (before filtering and integration): Selectable from –20 dB to +60 dB in steps of 10 dB
Variable Gain (before filtering and integration): Selectable from 0 dB to 11 dB in steps of 0.01 dB
Output Gain (after filtering and integration): Selectable 0 dB, 10 dB and 20 dB
Inherent Noise 2 Hz to 22 kHz
Single-ended: <5 fC (<7 fC @ 90% RH)
Floating: <10 fC
on AC output, referred to input with maximum sensitivity, Lower Frequency Limit = 1 Hz, and 1 nF transducer capacitance
Gain Accuracy (from input to AC output at 1 kHz):
Acceleration and force: Better than 2%
Velocity: Better than 2.5%
Displacement: Better than 3.0% @ 100 Hz
DeltaTron® INPUT:
Via BNC socket on front
Sensitivity:
100 µV to 10 V in steps of 10 dB for 1 V on AC output
30 µV to 10 V in steps of 0.01 dB for 1 V on AC output, with reduced frequency range
Gain:
Input Gain (before filtering and integration): Selectable from –20 dB to +60 dB in steps of 10 dB
Variable Gain (before filtering and integration): Selectable from 0 dB to 11 dB in steps of 0.01 dB
Output Gain (after filtering and integration): Selectable 0 dB, 10 dB, 20 dB
Gain Accuracy:
Acceleration and force: Better than 2%
Velocity: Better than 2.5%
Displacement: Better than 3.0%
Inherent Noise 2 Hz to 22 kHz:
<20 µV referred to input with maximum sensitivity and transducer output impedance <1 kΩ
Input Impedance: >100 kΩ
Power Supply for DeltaTron® Accelerometer:
Constant Current: 4 mA.
Max Voltage on DeltaTron® input: 27 V
Out-of-range detection on DeltaTron® supply voltage (<3 V or >21 V)
PREAMP OUTPUT:
BNC socket on rear
Acceleration signal after 1st order high-pass filter, input gain and variable gain
Max. Output: 5 V peak (5 mA peak)
Output Impedance: 50 Ω
DC Offset: –50 <offset <+50 mV
AC OUTPUT:
Via BNC socket on rear
Fully conditioned signal
Max. Output: 5 V peak (5 mA peak)
Output Impedance: 50 Ω
DC Offset: –10 <offset <+10 mV
FREQUENCY RANGE:
Acceleration & Force:
0.2 Hz (better than –10% limit) to 100 kHz (better than –20% limit)
With variable gain selected: 0.2 Hz to 40 kHz (better than –10% limit)
Velocity:
1 Hz to 10 kHz (better than ±10% limits)
Displacement:
1 Hz to 1 kHz (better than ±10% limits)
LOW–PASS FILTERS:
2-pole Butterworth (maximally flat)
Selectable –3 dB limits of 1, 3, 10, 30 kHz and OFF
Filter Slope: 40 dB/decade
Accuracy on –3 dB Limit Freq.: ±5%, re 1 kHz without filter
HIGH-PASS FILTERS:
3-pole Butterworth (maximally flat)
Selectable –3 dB limits of 0.1, 0.3, 1, 3, 10, 30 Hz and OFF
Filter Slope: 60 dB/decade
Accuracy on –3 dB Limit Freq.: ±10% (3, 10, 30 Hz), +10/–15% (0.1, 0.3, 1 Hz), re 1 kHz without filter
ADDITIONAL FILTERS:
External filter connection via 15-pole D-sub-connector on rear.
Optional custom internal filtering available on request.
External filter serially connected to standard filters
DISTORTION:
<0.12% to 10 kHz, <1% to 100 kHz
TEST OSCILLATOR:
159.2 Hz (=1000 rad/s), 100 pC sinusoidal, ±1%
SIGNAL RMS DECTECTOR:
3 digits read out on LCD
Accuracy for crest factor <3:

Freq. Range	Dynamic range referred to 1 V on AC output	Accuracy referred to input**
1 Hz to 10 kHz	+10 dB to –30 dB*	±5%
1 Hz to 30 kHz	+10 dB to –30 dB*	±10%
1 Hz to 100 kHz	+10 dB to –20 dB	+10% –25%
1 Hz to 100 kHz	+10 dB to –10 dB	+5% –20%

For 60 s linear averaging:
* the dynamic range is +10 to –20 dB
** 10% must be subtracted from the negative accuracy value (e.g. +5%, –15%, etc.)

Averaging Time:
Exponential: 125 ms, 1 s, 10 s
Linear: 1 s or 60 s based on 125 ms exp. values
SIGNAL PEAK DETECTOR:
3 digits read out on LCD
+Peak, –Peak:
Settling time for a level shift from 0 to 3 V on AC output:
56 µs (to –10% of value)
72 µs (to –5% of value)
94 µs (to –2% of value)
Read-out (at AC output) value for a 3 V peak of a period of one half sine with a (full period) frequency as listed:

Sine Frequency	Read-out (% of FS peak value)
1.0 kHz	–2%
2.5 kHz	–8%
5.0 kHz	–20%
10.0 kHz	–40%

Max Peak Hold Time:
0.5 s to 60 s in steps of 0.5 s or infinite
Max peak reset function
Dynamic range:
+30 mV to 3 V on AC output (40 dB)
Peak-to-Peak:
The numerical sum of +peak and –peak with extra hold time as described above
OVERLOADS:
Signal Overload:
Peak overloading internal circuits
Upper 20 dB:
Indicates that at least one internal circuit is operating less than 20 dB from overload
CM Overload:
Common mode peak voltage >5 V at floating charge input
DeltaTron® Overload:
DeltaTron® supply voltage <3.0 V or >21.0 V
GAIN AUTORANGE:
None (manual gain setting)
On output gain only
On input and output gain
OVERLOAD RECOVERY TIME: <200 µs
Time for output to recover to within 250 mV of the original value after termination of a half sine pulse of 50 µs duration at the baseline. Pulse amplitude is 4 times the full scale input, peak
ACCELEROMETER MOUNTED RESONANCE MEASURING (EP patent 715.722, US patent 5,753,793)**:**
Done via pulse method measuring. Exciting pulse ±15 V, 3 kHz to 60 kHz
Can be used with a number of Brüel & Kjær Charge Accelerometers
EXTERNAL FILTER:
Connected between the internal filters and the output gain
ALARM FUNCTION:
Level monitoring with alarm output
Alarm Output:
In the 15-pole D-Sub socket on rear of amplifier

Specifications 2525 (cont.)

Relay: SPDT, Max. 48 V, 0.5 A
Alarm On/Off:
Selectable via LCD and Interface bus
Level:
Selectable over the entire dynamic range. Monitoring will de-select while the autorange is changing gain (missing time periods after gain shifts)
Level Exceed Time:
Adjustable from 0 to 60 s in steps of 1 s
Alarm Hold Time:
Adjustable from 1 to 60 s or infinite
Alarm Reset Function
Detector Type:
Selectable RMS, +Peak, –Peak, Peak-to-Peak. Averaging/Hold time is transferred from detector set-up. Detectors are sampled at 125 ms intervals (same interval as LCD meter digit updating)
DETECTOR DC OUTPUT:
In 15-pole D-Sub socket on rear
V/unit: equal to V/unit for AC output
Max Output: 3.5 V (5 mA peak)
Output Impedance: 50 Ω
DC Offset: <±5 mV
Detector Type:
Selectable RMS, +Peak, –Peak, Peak-to-Peak. Averaging/Hold time is transferred from detector set-up
Sampling Frequency:
Output is updated at 125 ms intervals (same interval as LCD meter digit updating). No curve fitting on output
IEEE–488 INTERFACE:
The functions implemented conform to IEEE–488.1 and IEC 625–1 standards. Any function shown on display can be transmitted to and from the apparatus
Functions Implemented:

Source Handshake	SH1
Acceptor Handshake	AH1
Talker	T6
Listener	L4
Device Clear	DC1
Remote Local	RL1

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, hardwired RTS/CTS, Modem DCD

Power Supply

Mains: 90 V–127 V or 200 V–240 V; 24 VA

Dimensions and Weight

Height: 132.5 mm (5.22″)
Width: 139.5 mm (5.49″)
Depth: 320 mm (12.6″)
Weight: 3.6 kg (5.8 lb.)

Note: All values are typical unless measurement uncertainty or tolerance field is specified.

COMPLIANCE WITH STANDARDS:

CE	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive.
Safety	EN 61010–1 and IEC 1010–1: Safety requirements for electrical equipment for measurement, control and laboratory use.
EMC Emission	EN 50081–1: Generic emission standard. Part 1: Residential, commercial and light industry. EN 50081–2: 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	EN 50082–1: Generic immunity standard. Part 1: Residential, commercial and light industry. EN 50082–2: Generic immunity standard. Part 2: Industrial environment. **Note 1:** The above is guaranteed using accessories listed in this Product Data sheet only. **Note 2:** See "EMC"
Temperature	IEC 68–2–1 & IEC 68–2–2: Environmental Testing. Cold and Dry Heat. Operating Temperature: 5 to 40°C (41 to 104°F) Storage Temperature: –25 to +70°C (–13 to +158°F)
Humidity	IEC 68–2–3: Damp Heat: 90% RH (non-condensing at 40°C (104°F))
Mechanical	Non-operating: IEC 68–2–6: Vibration: 0.3 mm, 20 m/s^2, 10–500 Hz IEC 68–2–27: Shock: 1000 m/s^2 IEC 68–2–29: Bump: 1000 bumps at 250 m/s^2
Enclosure	IEC 529: Protection provided by enclosures: IP 20

EMC

SUSCEPTIBILITY TO DISTURBANCES SPECIFIED IN EN 50082–2:
Measured using Accelerometer Cable AO 1382. Charge floating measurements according to User Manual with Ferrite Cable Clamp LK 0014 mounted on accelerometer cable.
At magnetic field 80 A/m charge input noise can increase to 25 fC

RADIATED RF: (3 to 10 V/m, 80% AM, 1 kHz)
CONDUCTED RF: (3 to 10 V, 80% AM, 1 kHz)

Input	Radiated	Conducted
DeltaTron®[1]	<0.6 mV	<20 µV
Charge, single ended[2]	<0.3 pC	<0.02 pC
Charge, floating[2]	<0.3 pC	<6 pC

[1] Measured with max. gain and 50 Ω AC termination
[2] Measured with max. gain and 1 nF termination

Ordering Information

Type 2525	Measuring Amplifier
Includes the following accessories:	
JP 0162:	TNC to Microdot Adaptor
AN 0010:	Mains Cable
VF 0032:	T 630 mA Fuse
VF 0042:	T 315 mA Fuse
LK 0014:	Ferrite Cable Clamp
VP 7758:	Type 2525 Communication Demo Program

Optional Accessories

AO 1382:	1.2 m Microdot Accelerometer Cable, double screened for extra EMC protection
JP 1501:	15-pole Sub-D Connector
DH 0647:	Housing for JP 1501
JP 0145:	BNC to Microdot Adaptor
JP 0226:	TNC to BNC Adaptor
AO 0265:	IEEE Interface Cables
KK 0047:	Frame for 19″ rack
WH 3103:	ISO 5349 Hand-arm filter
WH 3267:	900 Hz to 1100 Hz band pass filter
WH 3112:	A-weighting filter
WH 3172:	Whole body vibration z-filter

Brüel & Kjær

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