

INSTRUCTION MANUAL

Vibration Monitor

UG-41

 **RION CO., LTD.**

3-20-41 Higashimotomachi, Kokubunji, Tokyo 185-8533 Japan

Precautions

- Operate the unit only as described in this manual.
- Do not use or store the unit in locations which
 - may be subject to high levels of dust or other contaminants, or
 - may be subject to air with high salt or sulphur content, subject to gases, or are in the vicinity of stored chemicals, or
 - may be subject to high temperature, humidity, or direct sunlight, or
 - may be subject to vibrations or shock.
- Protect the unit from shocks during transport, installation, and use.
- Do not disassemble the unit or attempt internal alterations.
- In case of malfunction, do not attempt any repairs. Note the condition of the unit clearly and contact the supplier or an authorized service station.

Contents

Organization of This Manual	i
Precautions	ii
Outline	1
Parts and Functions	2
Front Panel	2
Setup Panel	3
Preparations	7
Panel Installation	7
Setting the On-Board Switches	9
Terminal Strip Wiring	12
Operation	16
AC Power Supply Connection	16
Monitor Mode Setting	17
Measurement Range Setting	18
Alarm Functions	20
Canceling the Alarm Functions	23
Alarm Function Example	25
Monitor Operation	26
Unit Characteristics	27
Block Diagram	28
Frequency Characteristics of Main Circuit in Various Modes	29
Acceleration Circuit Filter Frequency Characteristics	30
Main Circuit Filter Frequency Characteristics	31
Specifications	32

Outline

The UG-41 is designed for constant monitoring of vibrations in machine installations and similar, using a combination of an accelerometer and UG-24 preamplifier or an accelerometer with built-in preamplifier.

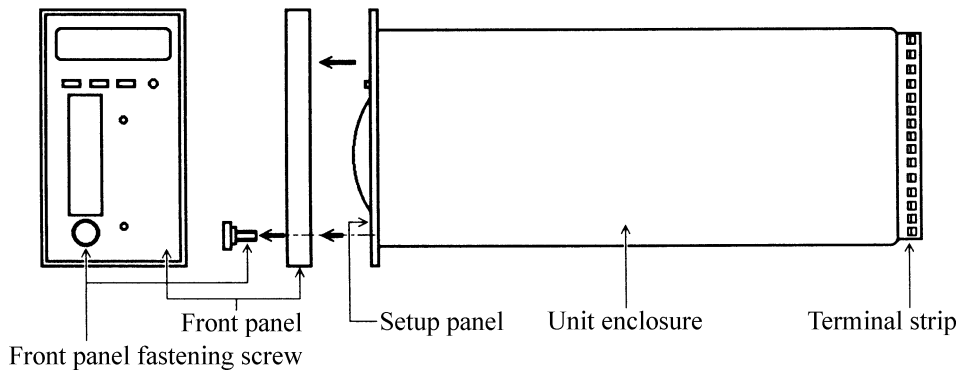
The unit incorporates both a main circuit and a dedicated acceleration circuit. The main circuit can be switched to measure acceleration, velocity, or displacement. The acceleration circuit always measures acceleration. This makes it possible to simultaneously monitor acceleration while monitoring velocity or displacement with the main circuit.

The main circuit incorporates a high-pass filter and a low-pass filter with selectable cutoff frequencies. By combining these filters, the frequency characteristics can be tailored to match the measurement target. The acceleration circuit also incorporates separate high-pass and low-pass filters with selectable cutoff frequencies.

The unit provides separate AC and DC outputs for the main circuit and acceleration circuit. For the main circuit, the alarm threshold and trip threshold can be set separately, to trigger an alarm or trip condition when the vibration level exceeds the respective threshold. An alarm function for indicating input signal interruption is also built in.

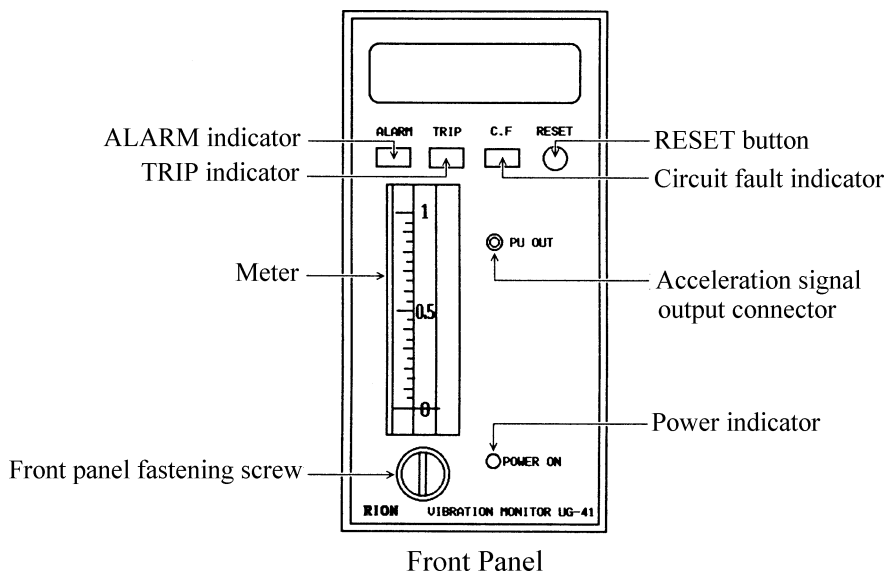
The separately available isolation unit UG-31 can be installed in the unit, to provide a current output.

Parts and Functions



Remove the front panel fastening screw and remove the front panel to gain access to the setup panel.

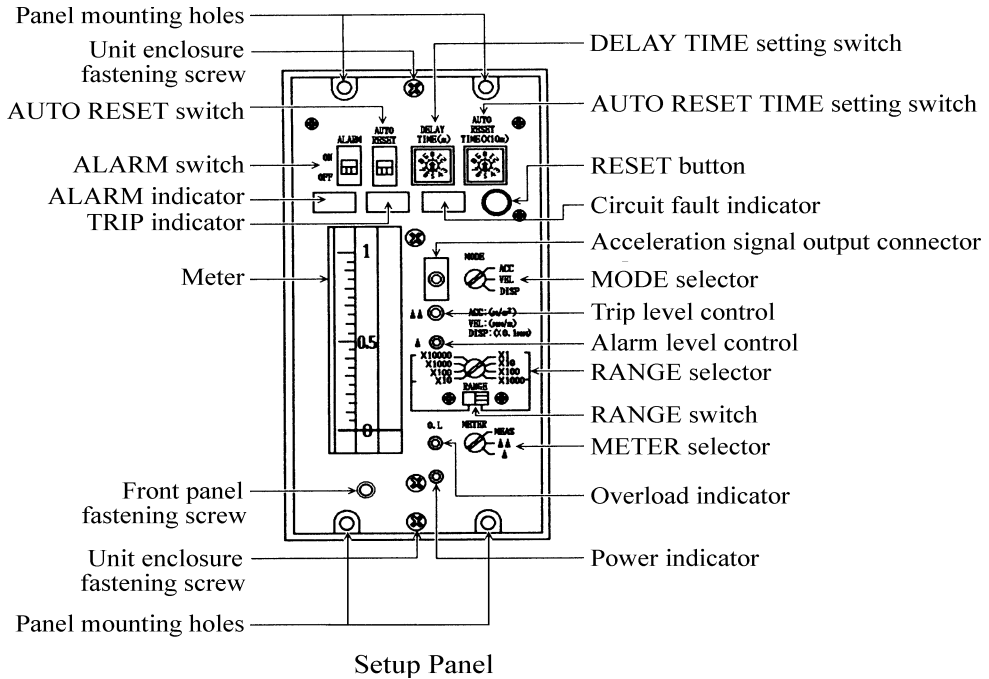
Front Panel



All parts necessary for monitoring, such as the alarm indicators and meter, are visible also when the front panel is attached. For normal operation, the front panel can therefore remain in place.

After making the required settings on the setup panel, reattach the front panel and tighten the fastening screw. This will prevent inadvertently changing any settings.

Setup Panel



Panel mounting holes

Two holes each at the top and bottom allow installing the unit in a panel or similar.

Unit enclosure fastening screws

After removing these screws (one each at the top and bottom), the setup panel with the attached circuit board can be pulled out of the unit enclosure, giving access to the controls located on the board.

ALARM switch

The alarm function is activated by setting this switch to ON. When activated, the alarm or trip condition will be triggered after the preset delay when the vibration level exceeds the preset alarm or trip threshold level. Similarly, when a circuit fault (input interruption) is detected, the circuit fault warning condition is triggered after the preset delay.

AUTO RESET switch

The auto reset function is activated by setting this switch to ON. When activated, the alarm or trip condition will be canceled automatically after the reset time when the vibration level falls below the alarm or trip threshold level.

Similarly, when the circuit fault (input interruption) is removed, the circuit fault warning condition will be canceled automatically after the reset time.

DELAY TIME setting switch

This switch serves to set the delay until the alarm or trip condition is triggered when the vibration level has exceeded the preset alarm or trip threshold level.

Similarly, when a circuit fault (input interruption) is detected, the circuit fault warning condition will be triggered after the same delay.

The delay time can be set from 0 to 9 seconds in 1-second steps.

AUTO RESET TIME setting switch

This switch serves to set the delay until the alarm or trip condition is canceled when the vibration level has fallen below the preset alarm or trip threshold level.

Similarly, when a circuit fault (input interruption) is removed, the circuit fault warning condition will be canceled after the same delay.

The reset time can be set from 10 to 90 seconds in 10-second steps.

RESET button (accessible from front panel)

Serves to manually reset the alarm or trip or circuit fault condition.

ALARM indicator (visible from front panel)

Lights up when the alarm condition has been activated.

TRIP indicator (visible from front panel)

Lights up when the trip condition has been activated.

Circuit fault (C.F.) indicator (visible from front panel)

Lights up when the circuit fault condition has been activated.

Acceleration signal output connector (PU OUT)

The input signal to the UG-41 (the signal from the preamplifier UG-24) is supplied without alteration at this connector.

MODE selector

Serves for setting the monitor mode of the main circuit to acceleration (ACC), velocity (VEL), or displacement (DISP). Depending on the mode setting and the high-pass and low-pass filter settings, the main circuit can operate with five different frequency characteristics.

Regardless of the mode setting for the main circuit, the dedicated acceleration circuit of the UG-41 always measures the acceleration level. However, the meter shows only the level for the mode selected for the main circuit.

Trip level control (▲▲)

To make an adjustment, set the METER selector to "▲▲" and then turn this control.

The trip threshold can be set to any point between 10 and 100% of the full-scale point of the meter.

Alarm level control (▲)

To make an adjustment, set the METER selector to "▲" and then turn this control.

The alarm threshold can be set to any point between 10 and 100% of the full-scale point of the meter.

RANGE selector

Serves to select the measurement range, from $\times 1$ to $\times 1000$, or from $\times 10$ to $\times 10000$.

RANGE switch

Switches the measurement range either to $\times 1 - \times 1000$ or to $\times 10 - \times 10000$.

METER selector

Selects the type of level to be displayed on the meter.

MEAS : Vibration level in selected monitor mode

▲▲ : Trip level

▲ : Alarm level

Meter

Shows the level selected with the METER selector on a linear scale from "0" to "1".

When the METER selector is set to "MEAS", the meter shows the type of vibration level selected with the MODE selector for the main circuit.

Overload (O.L.) indicator

Lights up when excessive vibration levels have overloaded the input of the unit.

Power (POWER ON) indicator (green, visible from front panel)

Lights up when the unit is powered.

Preparations

Note

Perform the preparation steps described below before connecting the AC power supply.

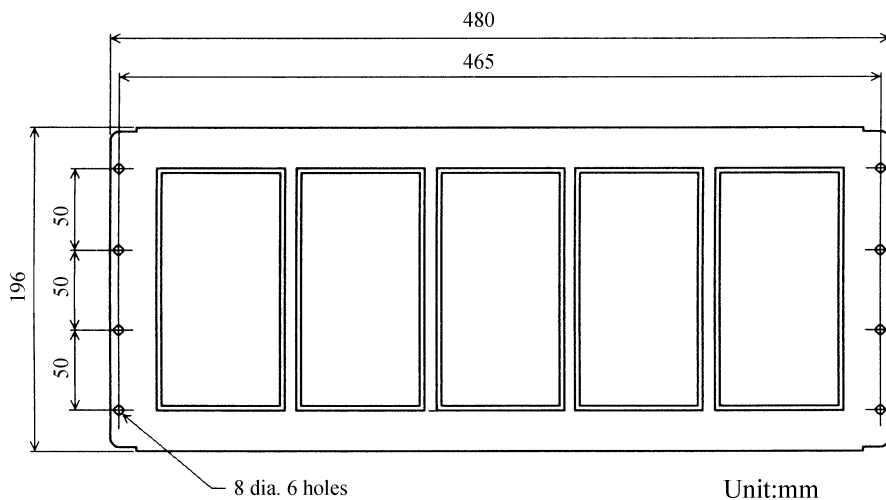
Panel Installation

Remove the front panel fastening screw and remove the front panel, so that the setup panel becomes accessible. Use the panel mounting holes (2 each at top and bottom) to mount the unit to a panel or similar.

Using the dedicated panel

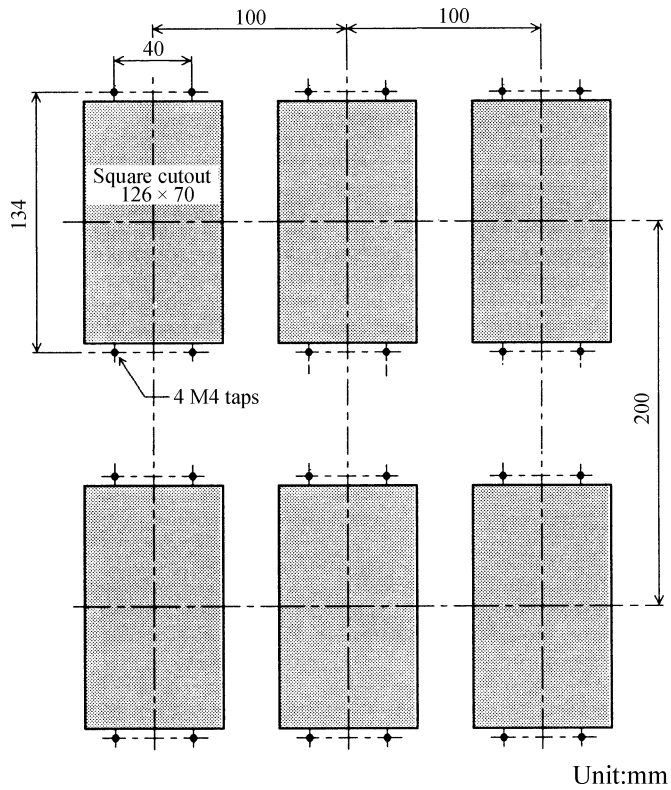
The separately available panel UG-90 is designed to accommodate up to five UG-41 units for five channels. The panel can then be mounted for example to a JIS rack.

Use four 4-mm screws to mount the UG-41 to the panel.



Direct mounting to an operation panel

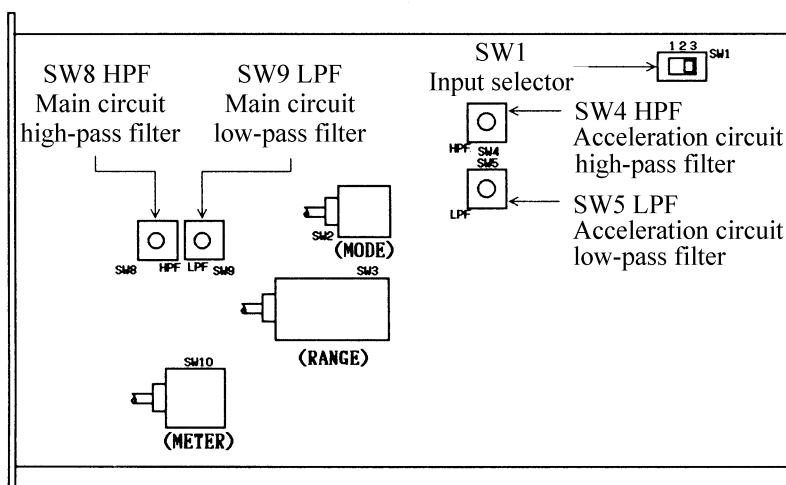
Use a steel plate of at least 2 mm thickness for the operation panel, and provide cutouts on the panel as shown below. The example shown below is for mounting six UG-41 units.



Setting the On-Board Switches

Remove the unit enclosure fastening screws (one each at the top and bottom). Grasp the setup panel and pull the board out of the enclosure to gain access to the on-board switches.

The board has the following switches: input selector (SW1), cutoff frequency selector switches for acceleration circuit filters (SW4, SW5) and main circuit filters (SW8, SW9). Set these switches as required by the application.

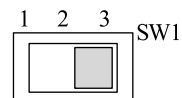


Layout of on-board switches

After the switches have been set, return the board to the enclosure and fasten the unit enclosure fastening screws again.

Input Selector (SW1) Setting

Set this switch according to the type of input signal supplied to the terminal strip (INPUT) on the rear panel.



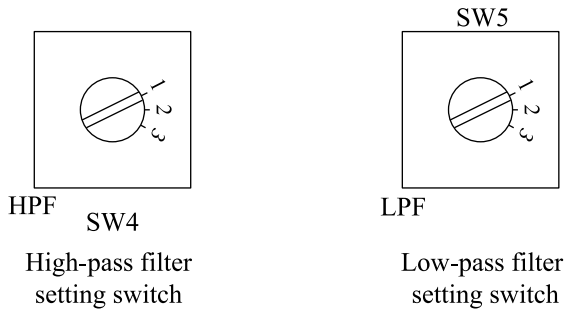
Setting position	Input
Between 2 and 3	Preamplifier UG-24 is connected
Between 1 and 2	accelerometer with built-in preamplifier is connected directly

Note

The following accelerometers with built-in preamplifier are available: water-proof type PV-11, explosion-proof type PV-14A.

Acceleration Circuit Filter Settings

1. High-pass filter (SW4 HPF)
2. Low-pass filter (SW5 LPF)



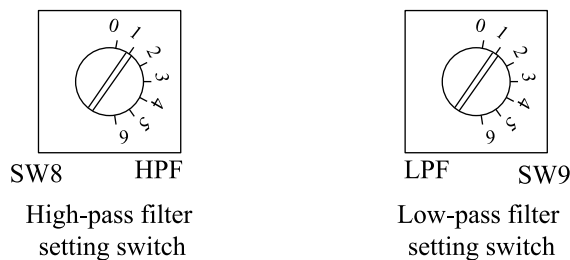
Acceleration circuit switches

Setting position	Cutoff frequency (Hz)
1	5 (Filter off)
2	10
3	500

Setting position	Cutoff frequency (Hz)
1	30k (Filter off)
2	500
3	2k

Main Circuit Filter Settings

1. High-pass filter (SW8 HPF)
2. Low-pass filter (SW9 LPF)



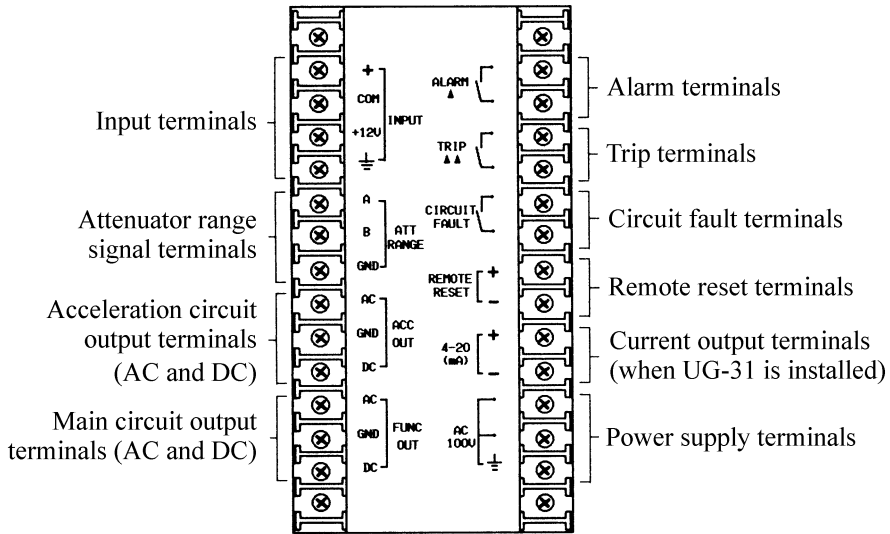
Acceleration circuit switches

Setting position	Cutoff frequency (Hz)
1	5 (Filter off)
2	10
3	30
4	50
5	500

Setting position	Cutoff frequency (Hz)
1	30 k (Filter off)
2	50
3	100
4	500
5	2 k

Terminal Strip Wiring

The terminal strip on the rear panel of the unit serves for input and output wiring. Use only cables with crimp-on lugs and fasten the lugs to the terminals by securely tightening the screws.



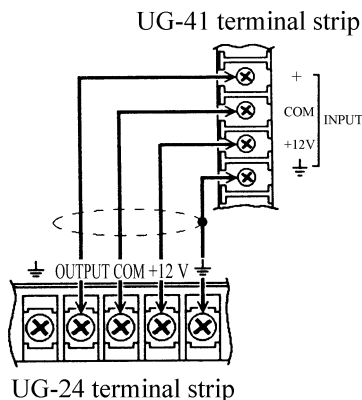
Terminal strip layout

Input terminals (INPUT)

These terminals serve for connection of the preamplifier UG-24 or an accelerometer with built-in preamplifier.

Set the on-board input selector (SW1) to the appropriate position, depending on which type of equipment is connected here (see page 9).

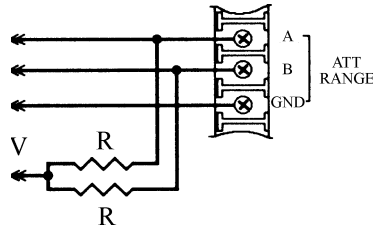
When the UG-24 is used, make the connection to the terminal strip on the UG-24 as shown at right. (For details, please refer to the instruction manual of the UG-41.)



Attenuator range signal terminals (ATT RANGE)

The setting status of the RANGE selector and RANGE switch on the setup panel is indicated by a signal output from terminals A and B (see page 19).

The terminals A and B are an open collector output. You should connect external pull-up resistors to these lines. The output can be used for data recording and processing.



Acceleration circuit output terminals (ACC OUT)

These terminals provide an AC and DC output from the dedicated acceleration circuit.

AC - GND: 2 V AC output corresponding to meter full-scale point

DC - GND: +10 V DC output corresponding to meter full-scale point

The output can be used for data recording and processing.

Main circuit output terminals (FUNC OUT)

These terminals provide an AC and DC output from the main circuit, corresponding to the currently selected mode.

AC - GND: 2 V AC output corresponding to meter full-scale point

DC - GND: +10 V DC output corresponding to meter full-scale point

The output can be used for data recording and processing.

Note

Depending on the measurement mode, the AC output voltage (sine wave) at the meter full-scale point is as follows.

Acceleration: 2 V PEAK

Velocity: 2 V RMS (= 2.828 V PEAK)

Displacement: 2 V P-P (= 1 V PEAK)

Alarm terminals (ALARM▲)

When the vibration level exceeds the preset alarm threshold and the preset delay time has elapsed, the relay contacts between these terminals close. When the alarm condition is canceled, the contacts open again.

The relay contacts are rated for 250 V AC, 3 A, or 30 V DC, 5 A.

The output can be used for alarm indication, to control external equipment, etc.

Trip terminals (TRIP▲▲)

When the vibration level exceeds the preset trip threshold and the preset delay time has elapsed, the relay contacts between these terminals close. When the trip condition is canceled, the contacts open again.

The relay contacts are rated for 250 V AC, 3 A, or 30 V DC, 5 A.

The output can be used for trip alarm indication, to control external equipment, etc.

Circuit fault terminals (CIRCUIT FAULT)

When the input to the unit has been interrupted (circuit fault) and the preset delay time has elapsed, the relay contacts between these terminals close. When the circuit fault condition is terminated, the contacts open again.

The relay contacts are rated for 250 V AC, 3 A, or 30 V DC, 5 A.

The output can be used for circuit fault alarm indication, to control external equipment, etc.

Remote reset terminals (REMOTE RESET)

When these two terminals are shorted, the alarm, trip, and circuit fault conditions are reset. This has the same effect as pressing the RESET button on the setup panel.

The terminals can be used for an external reset control circuit.

Current output terminals (4 - 20 (mA))

When the 4-20 mA isolation unit UG-31 (option) is installed, a DC current corresponding to the currently selected monitor mode is output here. For this output, the 0 - 10 V DC voltage is converted into a 4 - 20 mA DC current.

The output can be used for connection to equipment designed for current input.

Power supply terminals

Serve for connection of the 85 to 130 V AC power supply. Connect the ground terminal to the ground terminal of the power supply.

Operation

AC Power Supply Connection

When an AC power supply is connected, the unit becomes operative, and the power indicator (POWER ON) lights up.

Note
Before connecting the AC power supply, set the ALARM switch to OFF.

Monitor Mode Setting

Using the MODE selector on the setup panel, select the monitor mode that best fits the application: acceleration (ACC), velocity (VEL), or displacement (DISP). The frequency characteristics of the main circuit are determined by the selected mode and the cutoff frequencies set for the high-pass and low-pass filters of the main circuit. The vibration level is measured accordingly and shown on the meter.

MODE



ACC : (m /s²)

VEL : (mm /s)

DISP : (×0.1mm)

Note

The acceleration circuit operates independently of the selected mode setting. It always measures acceleration, according to the cutoff frequencies set for the high-pass and low-pass filters of the acceleration circuit. The result is output as an acceleration signal from the ACC OUT terminals.

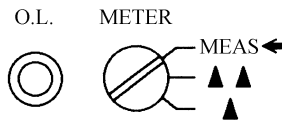
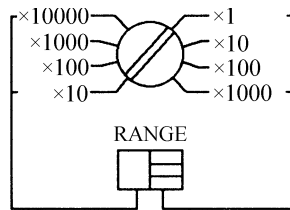
If the mode for the main circuit is set to ACC, an acceleration signal will be output both from the main circuit output terminals (FUNC OUT) and the acceleration circuit output terminals (ACC OUT), but this signal may not be identical, depending on the type of vibration being monitored and the filter settings for the two circuits.

The meter only shows the acceleration level as measured by the main circuit.

Measurement Range Setting

Set the measurement range as follows.

1. Set the MODE selector to the desired monitoring mode.
2. Set the METER selector to "MEAS" and measure the vibration.
3. Depending on the magnitude of the displayed vibration level, use the RANGE selector and RANGE switch to obtain a suitable indication. The measurement range according to the switch settings is shown in the table below. Choose a setting so that the meter does not register to end of the scale and the overload (O.L.) indicator does not light.

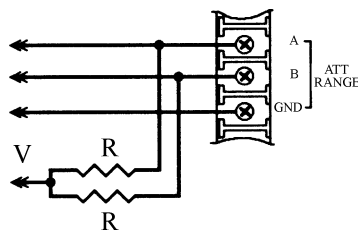


The relationship between the RANGE selector and RANGE switch setting and the vibration level when the meter is at the full-scale point ("1") is as shown below. The setting of the RANGE switch should be made according to the sensitivity setting of the preamplifier UG-24. (This setting is made using a shorting bar on the terminal strip of the UG-24. For details, please refer to the instruction manual of the UG-24.)

RANGE switch setting	RANGE selector setting	Vibration level at full-scale point		
		Acceleration (m/s ²)	Velocity (mm/s)	Displacement (mm)
Right side (UG-24 set to charge of less than 10000 pC)	× 1	1	1	0.1
	× 10	10	10	1
	× 100	100	100	10
	× 1000	1000	1000	100
Left side (UG-24 set to charge of 10000 pC or more)	× 10	10	10	1
	× 100	100	100	10
	× 1000	1000	1000	100
	× 10000	10000	10000	1000

Depending on the setting of the RANGE selector and RANGE switch, the attenuator range signal terminals (ATT RANGE) on the terminal strip at the rear of the unit output the following signal pattern on the terminals A, B, and GND.

RANGE switch setting	RANGE selector setting	Signal output level at terminal A	Signal output level at terminal B
Right side (UG-24 gain set for charges of less than 10000 pC)	× 1000	0	0
	× 100	1	0
	× 10	0	1
	× 1	1	1
Left side (UG-24 gain set for charges of 10000 pC or more)	× 10000	0	0
	× 1000	1	0
	× 100	0	1
	× 10	1	1



Alarm Functions

This unit incorporates two types of alarms for the vibration level as measured by the main circuit, as well as an alarm that indicates when the connection to the input terminals has been interrupted. When one of the alarms is triggered, the corresponding indicator on the setup panel lights up, and the relay contacts for the corresponding terminals on the terminal strip at the rear of the unit close, so that the terminals are shorted.

(1) Alarm indication (Caution)

This function is triggered when the vibration level exceeds the preset alarm level and the preset delay time has elapsed.

(2) Trip indication (Danger)

This function is triggered when the vibration level exceeds the preset trip level and the preset delay time has elapsed.

(3) Circuit fault indication

This function is triggered when an interruption in the signal input to the unit has been detected and the preset delay time has elapsed.

The settings for the alarm functions should be made according to the sequence described below.

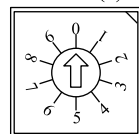
Note
Set the ALARM switch to OFF while you are making the alarm settings.

Delay Time Setting

This setting determines the delay time that elapses after the vibration level exceeds the alarm or trip threshold until the actual alarm or trip condition is triggered. Use the DELAY TIME setting switch to set the delay time to a value between 0 and 9 seconds, in 1-second steps.

The selected delay time is also applied to the circuit fault function, determining the delay between the point when a signal interruption is detected and the triggering of the circuit fault condition.

DELAY
TIME(s)



Alarm and Trip Level Setting

This setting determines the vibration level values which will trigger the alarm or trip condition.

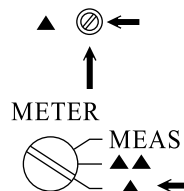
Note

The trip level cannot be set to a lower point than the alarm level.

Setting the alarm level

Set the alarm level as follows.

1. Set the METER selector to "▲".
2. Adjust the alarm level control (▲) so that the meter indication is at the point which you want to use as an alarm threshold. This point must be within the range of 10 - 100% of the full-scale indication. The actual numerical setting for the alarm level will depend on the selected mode and measurement range.

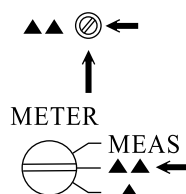


Setting the trip level

After setting the alarm level, set the trip level as follows.

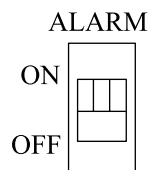
1. Set the METER selector to "▲▲".
2. Adjust the trip level control (▲▲) so that the meter indication is at the point which you want to use as a trip threshold. This point must be within the range of 10 - 100% of the full-scale indication.

The actual numerical setting for the trip level will depend on the selected mode and measurement range.



Activating the Alarm Functions

After making the settings as described above, set the ALARM switch to ON. The various alarm functions are now operative.



Canceling the Alarm Functions

The three alarms described in the previous section can be canceled according to two methods, as follows.

1. Using auto reset

When the vibration level falls below the alarm or trip threshold or the circuit fault is terminated (the signal is restored), the alarm condition will automatically be canceled after a preset delay.

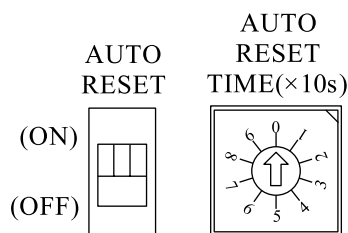
2. Using manual reset

The alarm condition is manually canceled by the operator.

When the alarm condition is canceled, the respective indicator on the setup panel goes out, and the relay contacts for the corresponding terminals on the terminal strip at the rear of the unit open.

Using the Auto Reset Function

To use the auto reset function, perform the following steps.



Setting the Auto Reset Time

Use the AUTO RESET TIME setting switch to set the number of seconds that will elapse after the vibration level has fallen below the threshold until the alarm condition is canceled. The setting can be made in the range from 0 to 90 seconds, in 10-second steps.

The selected auto reset time is also applied to the circuit fault function, determining the delay between the point when the interruption is restored and the canceling of the circuit fault condition.

Activating the Auto Reset Function

After making the settings as described above, set the AUTO RESET switch to ON. The auto reset function is now operative.

Using the Manual Reset Function

Manual Reset Setting

Set the AUTO RESET switch to OFF.

Manual Reset Operation

A reset is performed by pressing the RESET button on the front panel or by short-circuiting the REMOTE RESET terminals on the terminal strip at the rear of the unit.

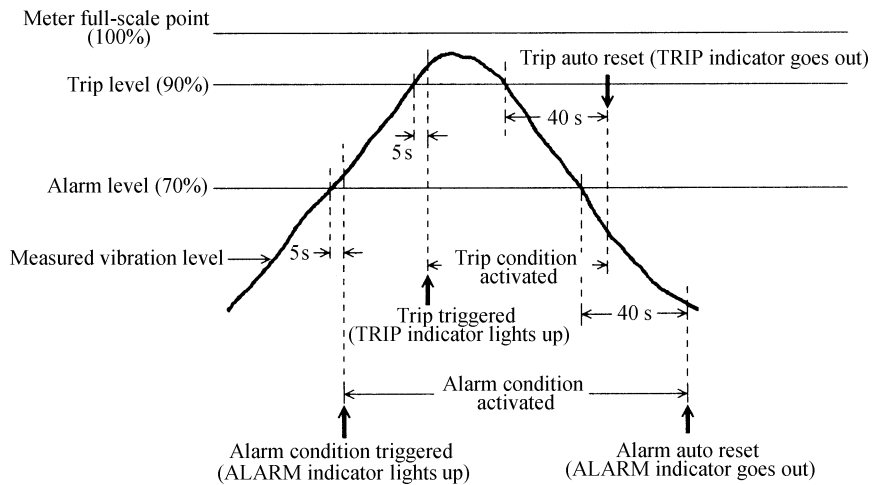
Alarm Function Example

An example for the action of the alarm and trip function using the sample settings listed below is shown in the illustration.

ALARM switch and AUTO RESET switch:

both set to ON

Delay time: 5 s
 Auto reset time: 40 s
 Alarm level: 70%
 Trip level: 90%



When one of the alarms is triggered, the corresponding indicator on the setup panel lights up, and the relay contacts for the corresponding terminals on the terminal strip at the rear of the unit close, so that the terminals are shorted. When the alarm condition is canceled, the respective indicator goes out and the relay contacts for the corresponding terminals open.

Monitor Operation

After all necessary settings for alarm and trip level, delay time etc. as well as for auto reset (if desired) have been made, prepare the unit for monitoring as follows.

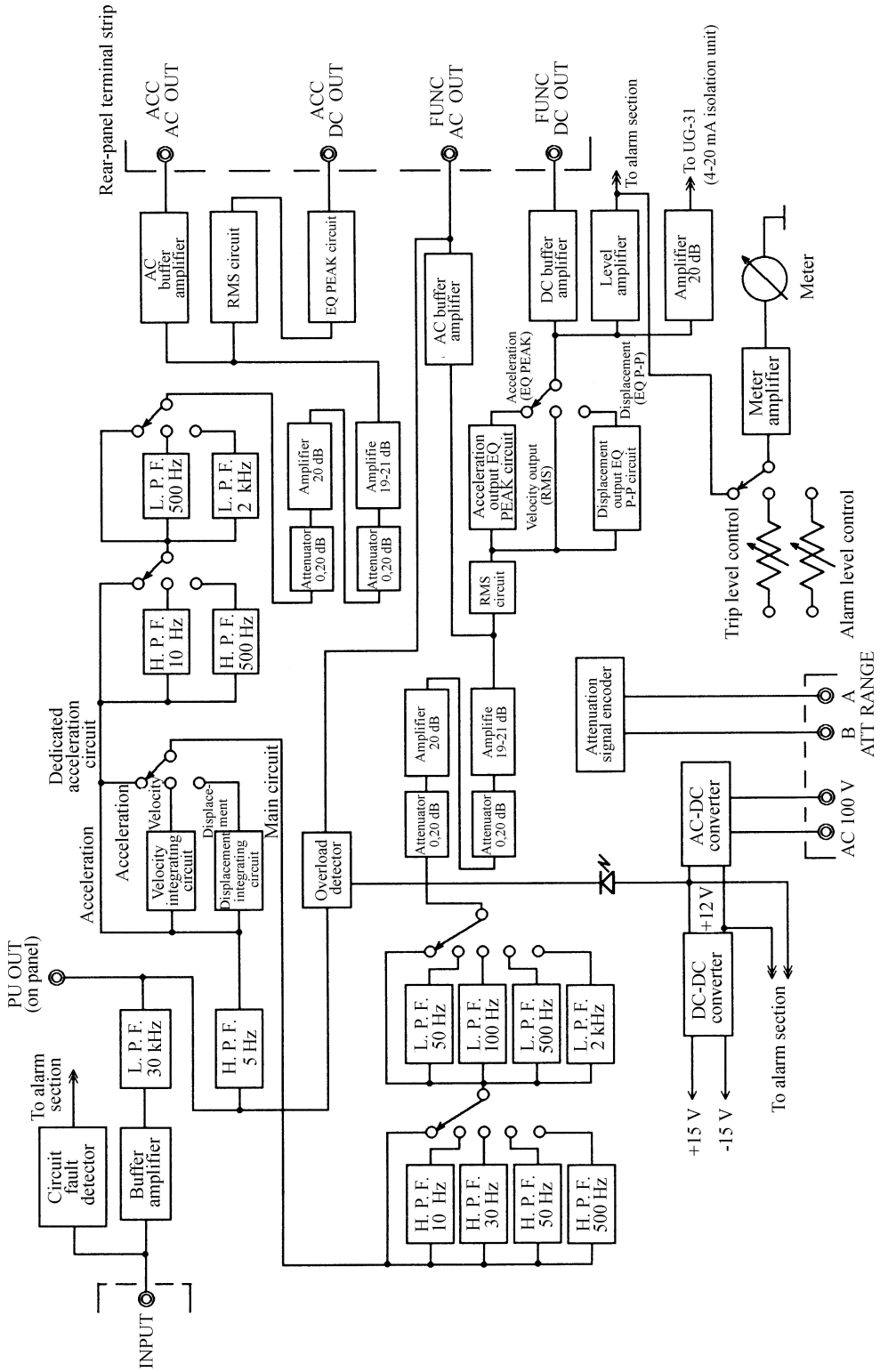
1. Set the METER selector to "MEAS".
2. Attach the front panel to the setup panel and secure it with the front panel fastening screw.

Use the meter and indicators visible on the front panel for monitoring.

Unit Characteristics

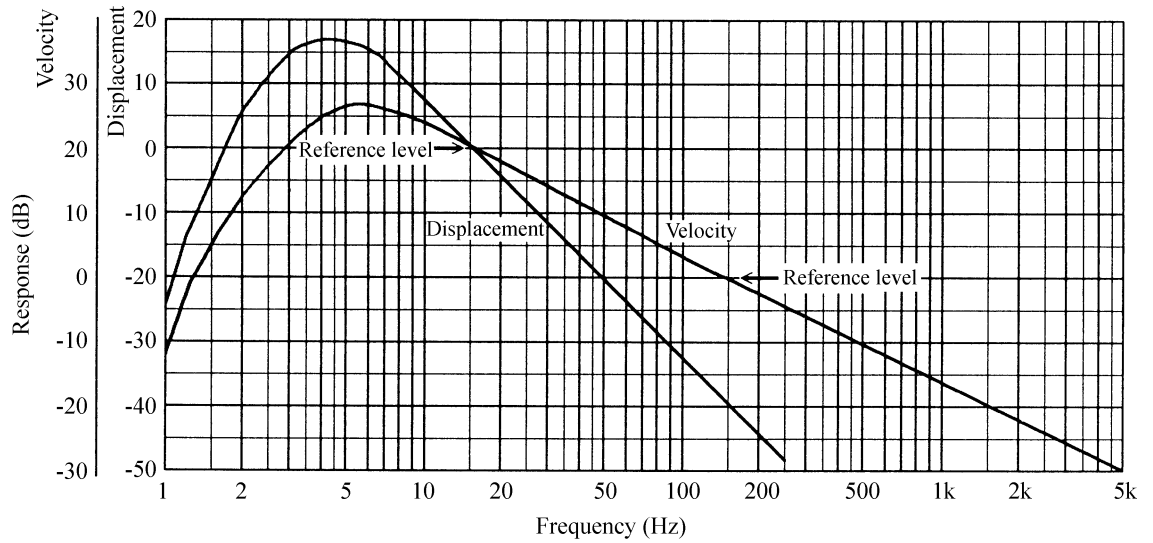
This section contains a block diagram, information about frequency characteristics for the various modes, as well as information about high-pass and low-pass filter characteristics for the acceleration circuit and main circuit.

Block Diagram



Frequency Characteristics of Main Circuit in Various Modes

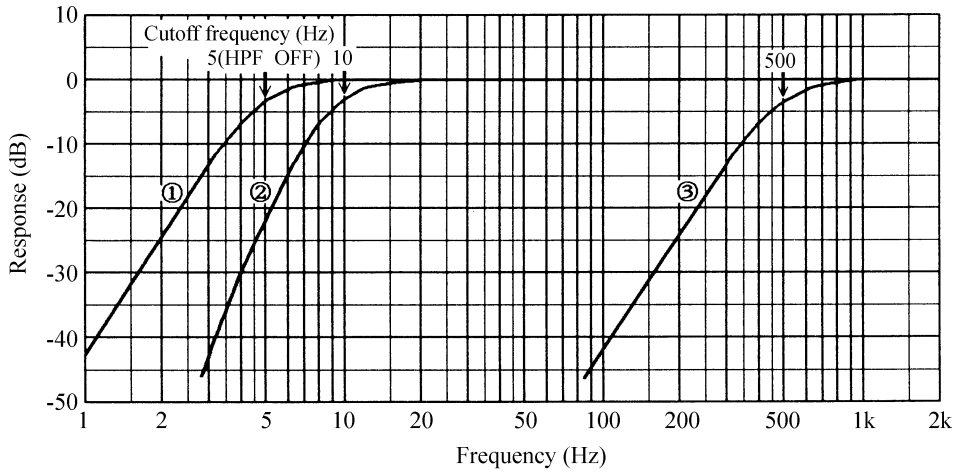
Velocity and displacement characteristics are shown below.



Velocity and displacement characteristics

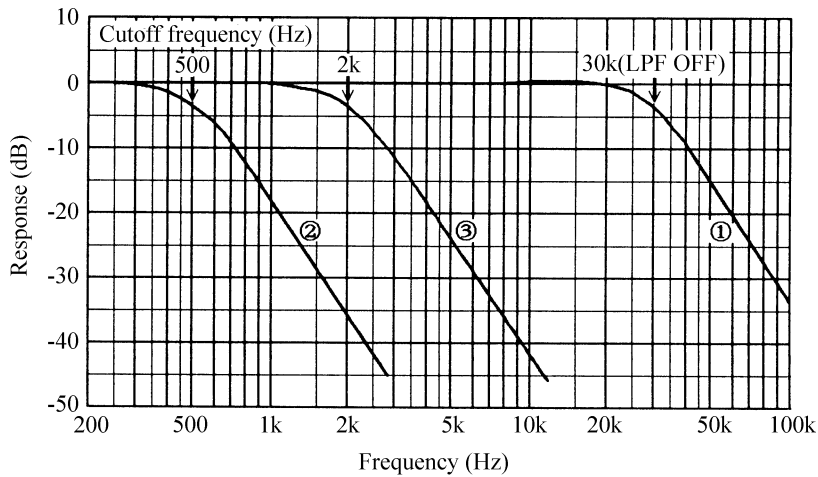
Acceleration Circuit Filter Frequency Characteristics

High-pass filter (set with on-board SW4 HPF)



High-pass filter characteristics (SW4 HPF) of acceleration circuit

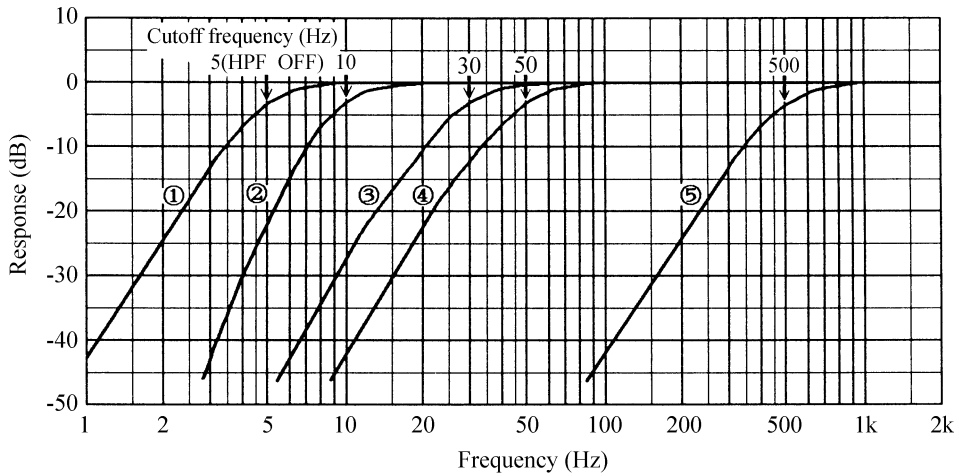
Low-pass filter (set with on-board SW5 LPF)



Low-pass filter characteristics (SW5 LPF) of acceleration circuit

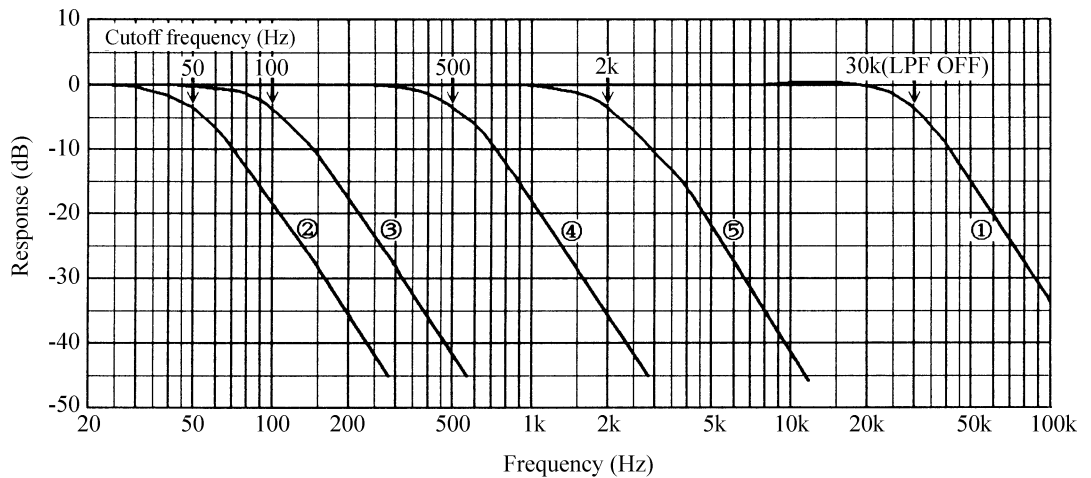
Main Circuit Filter Frequency Characteristics

High-pass filter (set with on-board SW8 HPF)



High-pass filter characteristics (SW8 HPF) of acceleration circuit

Low-pass filter (set with on-board SW9 LPF)



Low-pass filter characteristics (SW9 LPF) of acceleration circuit

High-pass filter

Cutoff frequency settings 5 (filter OFF), 10, 30, 50, 500 Hz

Cutoff slope -18 dB/oct

Low-pass filter

Cutoff frequency settings

30000 (filter OFF), 50, 100, 500, 2000 Hz

Cutoff slope -18 dB/oct

Meter

Linear scale, maximum "1", increment steps 0.05

Indication precision: $\pm 5\%$ from full-scale point

DC output

Configuration terminal strip

Output voltage 10 V $\pm 2\%$ (at meter full-scale point)

Maximum output +12 V

Output impedance approx. 50 ohms

Load impedance 10 kilohms or more

AC output

Configuration terminal strip

Output voltage 2 V $\pm 2\%$ (at meter full-scale point)Maximum output ± 12 V

Output impedance approx. 50 ohms

Load impedance 10 kilohms or more

Alarm settings

Alarm (caution) level any value between 10 and 100% of meter full-scale point

Trip (danger) level any value between 10 and 100% of meter full-scale point

Alarm level setting precision

 $\pm 5\%$ of meter full-scale

Alarm operation precision

 $\pm 5\%$ of setting value

Circuit fault alarm warns of input signal interruption

Operation delay time for all alarm functions

settable from 0 - 9 seconds in 1-second steps

Alarm output

Alarm indication	indicator lamps for all alarm functions
Output configuration	terminal strip
Output type	shorting of terminal contacts by internal relays for all alarm functions Relay contacts rated for 250 V AC, 3 A, or 30 V DC, 5 A

Alarm reset

Resetting method	auto reset or manual reset for all alarm functions (manual reset via button or remote reset terminals)
Auto reset time	settable from 0 to 90 seconds, in 10-second steps
Acceleration circuit	Constantly monitors acceleration separately from main circuit

DC output

Configuration	terminal strip
Output voltage	10 V \pm 2% (at meter full-scale point)
Maximum output	+12 V
Output impedance	approx. 50 ohms
Load impedance	10 kilohms or more

AC output

Configuration	terminal strip
Output voltage	2 V \pm 2% (at meter full-scale point)
Maximum output	\pm 12 V
Output impedance	approx. 50 ohms
Load impedance	10 kilohms or more

High-pass filter

Cutoff frequency settings	5 (filter OFF), 10, 500 Hz
Cutoff slope	-18 dB/oct

Low-pass filter

Cutoff frequency settings	30000 (filter OFF), 500, 2000 Hz
Cutoff slope	-18 dB/oct

Power requirements**Power supply voltage range**

85 - 130 V AC

Frequency range

45 - 70 Hz

Power consumption

approx. 8 VA

Preamplifier power supply output**Preamplifier power supply output provided at input section****Configuration**

terminal strip

Output voltage

+12 V DC

Operating temperature and humidity range

-10 to +50°C, max. 90% RH

Dimensions

148 (W) × 80 (H) × 327 (D) mm

Weight

Approx. 2.1 kg

Supplied accessories

Instruction manual (1)

