

Instruction Manual

8 Channel IEPE Conditioner M208A

From Version 001.012



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Thank you for using a vibration instrument from Metra!

1. Application

The 8 Channel IEPE Conditioner M208A was designed for piezoelectric accelerometers, force transducers, pressure transducers and measuring microphones with IEPE output. The instrument has the following functions:

- Constant current supply of up to eight sensors
- Gain ranges of 0, 20, 40 and 60 dB
- Normalization of transducer sensitivity
- High pass and low pass filtering, optionally single and double integration

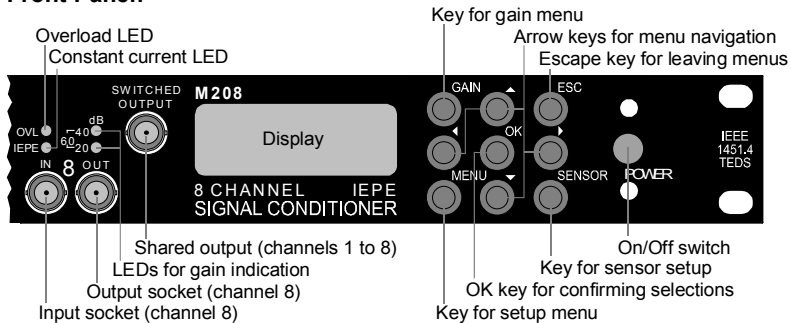
In addition, the M208A can display RMS or peak values including physical units.

A relay output is available for controlling external devices. The M208A features a serial interface for setup and readout by a supplied PC software. The Ethernet interface and the embedded web server of the instrument provide network and Internet connectivity.

2. The Instrument at a Glance

2.1. Connectors and Controls

Front Panel:



Rear Panel:

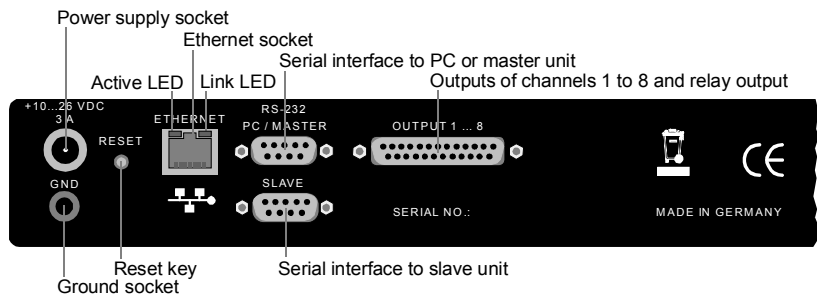


Figure 1: Front and rear panels

2.2. Display Functions

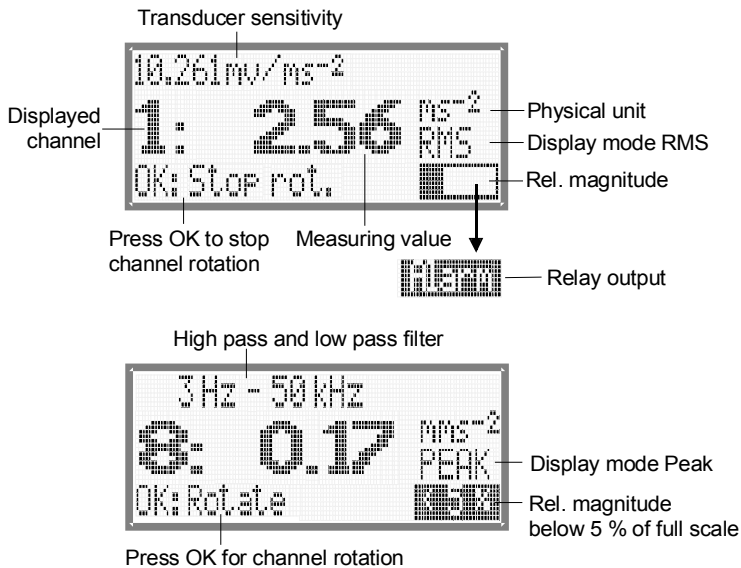
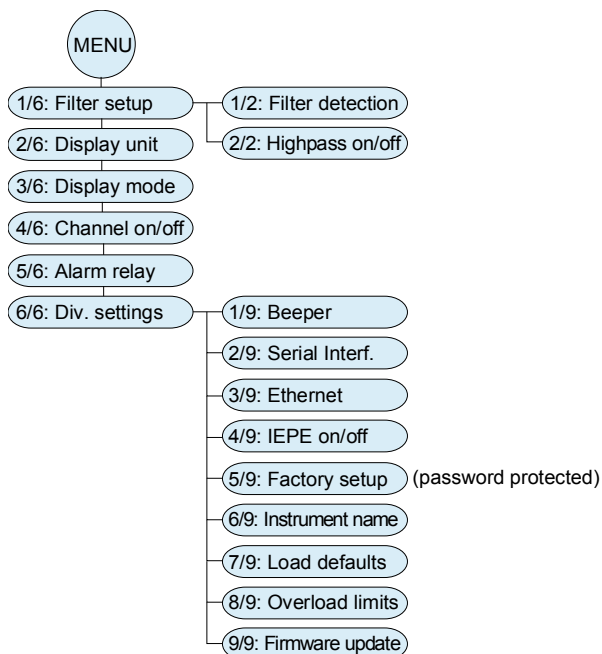


Figure 2: Display in measuring mode

2.3. Menu Structure



3. What is IEPE?

The M208A is a signal conditioner for sensors with IEPE output. The abbreviation stands for Integrated Electronics Piezo Electric and is a common industrial standard for the output of piezoelectric sensors and microphones. Proprietary brand names, like ICP®, Isotron®, Deltatron®, Piezotron® etc., are also used for the same purpose.

An electronic circuit inside the sensor transforms the high-impedance signal of the sensing element into an output signal with low impedance, which can more easily be transmitted and processed.

A distinctive feature of IEPE is the transmission of supply current and measuring signal via one single wire, so an IEPE transducer is connected via a coaxial cable.

3 shows the principle circuit of an IEPE measuring chain. To supply the sensor electronics, constant current is used (not to be confused with 4-20 mA current loops). The constant current is fed into the signal cable by the signal conditioner. A coupling capacitor keeps the DC components away from the AC signal path.

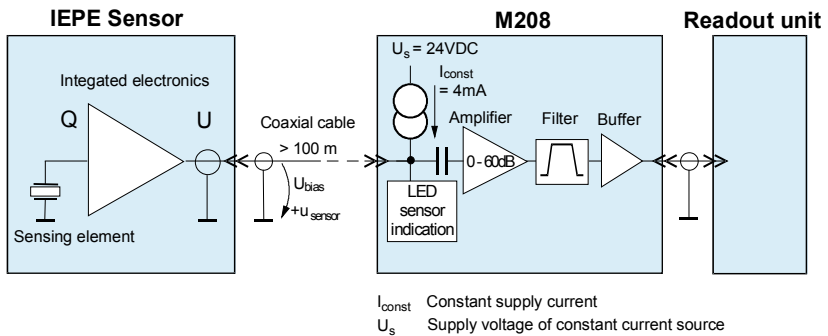


Figure 3: IEPE principle

When constant current is fed into the sensor, a positive DC voltage, called bias voltage, arises at the sensor terminals. Depending on model and manufacturer, the bias voltage can be in the range from 5 to 14 V. The bias voltage is modulated with the measuring signal u_{sensor} . The sensor output can never become negative. The minimum output voltage is approximately 1 V, the saturation voltage of the sensor output stage. The upper voltage limit is determined by the supply voltage of the constant current source, also called compliance voltage. The M208A uses 24 V. 4 shows the dynamic range of an IEPE transducer.

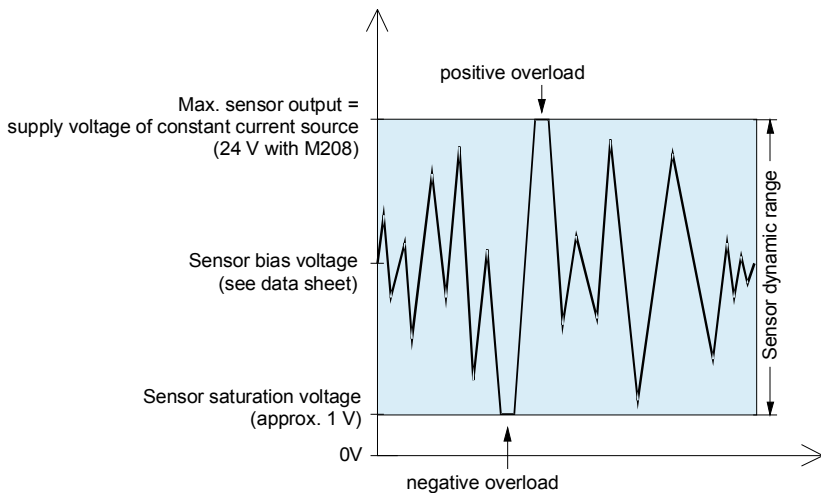


Figure 4: Dynamic range of IEPE sensors

The M208A features a circuit for sensor check. It can detect the following conditions, based on the sensor output voltage:

- No sensor present (yellow LED off, no measuring value for this channel)
- Sensor detected (yellow LED on, measuring value displayed)
- Short circuit at input (display “IEPE SHORT”)

The constant current supply can be switched off for each channel (see section 12.4. on page 31). The sensor detection will then also be deactivated.

4. What is TEDS?

The M208A includes full TEDS support.

The abbreviation TEDS stands for “Transducer Electronic Data Sheet”. It specifies sensors containing a memory device holding their most important characteristics. An advantage of TEDS is that these characteristics are associated with the sensor and cannot get lost. The measuring system can configure itself without entering any data manually after the sensor being plugged in.

IEEE 1451 describes the memory, the interface and the arrangement of data. In part 4 of this standard a sub-group of TEDS transducers is described which is compatible with IEPE inputs. The memory can be accessed via the signal cable by means of a negative logical pulse chain. When these sensors are supplied by constant current, they perform like normal IEPE sensors. 5 shows the principle of TEDS.

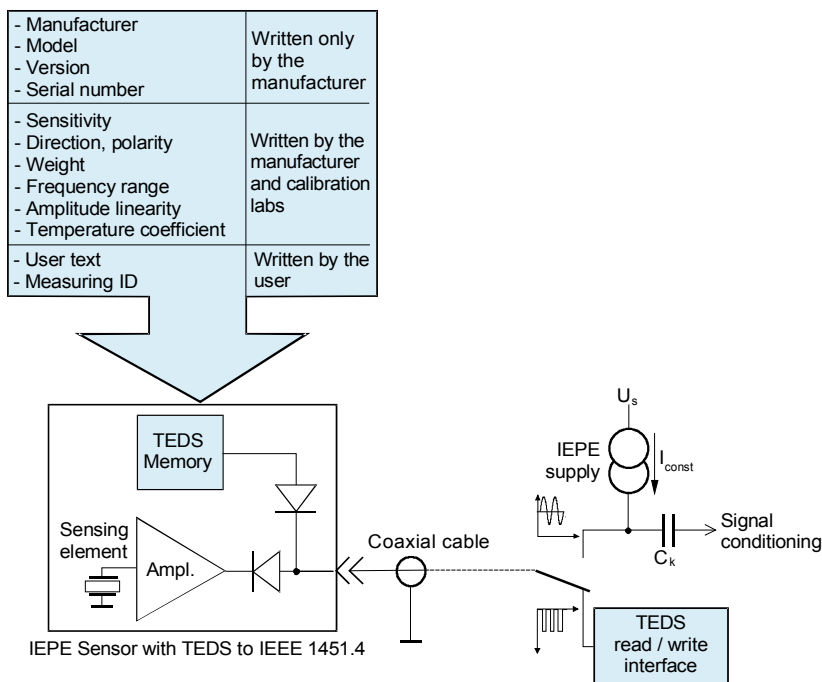


Figure 5: TEDS principle

TEDS sensors include a memory device DS2430A with a so-called 1-Wire[®] interface made by Dallas/Maxim. This memory is divided into a 64 bit ROM portion, called application register, which may be programmed once, and a re-programmable 256 bit EEPROM portion.

The application register, called the basic TEDS, contains data stored by the manufacturer. This data cannot be edited. It includes:

- Manufacturer code
- Type identifier
- Version number
- Version letter
- Serial number

The EEPROM holds sensor data which may be edited for calibration purposes. Type and arrangement of this data depends on the TEDS template used. Standard templates are published on the IEEE server at <http://standards.ieee.org/regauth/1451>. In addition there are proprietary manufacturer templates.

The M208A supports the standard template no. 25 for piezoelectric accelerometers and force transducers and the template nos. 27 and 28 for measuring microphones. These templates allow the specification with or without a transfer function by means of switch bits.

Template No. 25 for piezoelectric accelerometers and force transducers:

Without transfer function:

- Sensitivity
- Lower frequency limit
- Measuring direction
- Weight
- Polarity
- Calibration frequency
- Calibration temperature
- Calibration date
- Calibration initials
- Calibration interval
- ID of measuring point
- User text

With transfer function:

- Sensitivity
- Lower frequency limit
- Measuring direction
- Weight
- Polarity
- Low pass frequency
- Resonance frequency
- Resonance quality
- Amplitude slope
- Temperature coefficient
- Calibration frequency
- Calibration temperature
- Calibration date
- Calibration initials
- Calibration interval
- ID of measuring point
- User text

Template No. 27 for measuring microphones:

Without transfer function:

- Sensitivity
- Reference frequency
- Reference polarization voltage
- Microphone type
- Microphone size
- Equivalent volume
- Polarity
- Calibration date
- Calibration initials
- Calibration interval
- ID of measuring point
- User text

With transfer function:

- Sensitivity
- Reference frequency
- Reference polarization voltage
- Microphone type
- Microphone size
- Equivalent volume
- Actuator / correction
- High pass frequency
- Resonance frequency
- Resonance quality
- Polarity
- Calibration date
- Calibration initials
- Calibration interval
- ID of measuring point
- User text

5. Description

6 shows the block diagram of the M208A. The instrument includes eight identical analog signal paths for amplification and filtering. A micro controller unit controls the analog part, provides digital interfaces, key control and display functions.

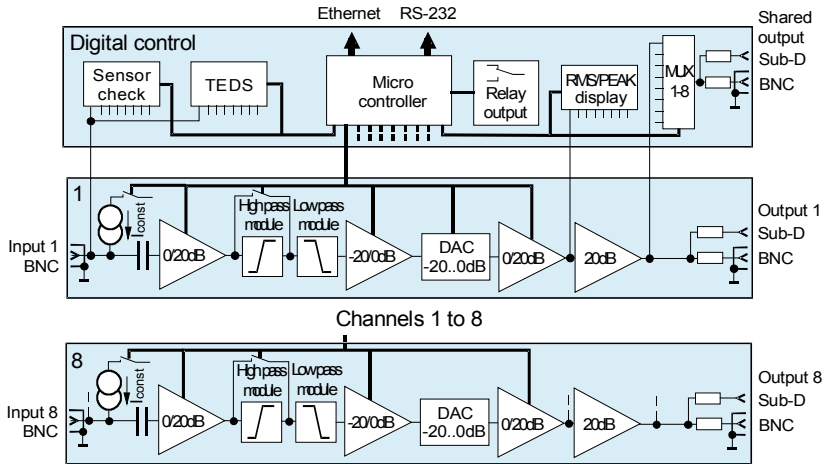


Figure 6: Block diagram

The sensor signals enter the M208A via BNC sockets on the front panel. The IEPE constant current sources may be switched off individually. The input is followed by an amplifier stage with selectable gains of 0 or 20 dB. High pass and low pass filters are designed as plug-in modules. The high pass can be switched off. There are also single and double integrator modules which may be plugged in instead of the filters. A selectable attenuator stage is followed by a digital-to-analog converter for fine gain tuning. It is used for transducer normalization. Before the output there is another selectable amplifier stage and a buffer. Splitting the gain before and after the filters helps to avoid overload at frequencies in the filter stop band. The output is accessible on the front panel via BNC sockets and on the rear panel via a Sub-D connector. There is a shared output which can be switched to channels 1 to 8.

The analog-to-digital converter of the micro controller unit measures the output voltage of each channel for one second. It can display RMS or peak values. The displayed measuring values can be used to trigger a relay output which is also connected to the Sub-D connector on the rear panel.

Model M208A supports sensors with TEDS to IEEE 1451.4. Sensors are automatically identified after connection. The stored sensitivity is read and the amplifier gain is normalized accordingly to provide a gain in volts per mechanical unit.

An RS-232 interface and an Ethernet interface serve for external control and read-out. Up to eight M208A units can be controlled via one RS-232 interface by connecting them to each other using the master and slave interfaces.

The M208A is powered from a DC voltage source.

6. Power Supply

The M208A is powered by an external DC supply voltage from 10 to 28 V. This could be a supplied mains adapter or a car battery, for example. Current consumption is below 1.5 A. The supply voltage is connected by a circular power connector to DIN 45323. 7 shows the polarity of this socket.



Figure 7: Polarity of the supply socket

The M208A is protected against false polarization.

There is a fuse inside the instrument. For replacing the fuse, remove the four screws holding the cover plate and open the case. The location of the fuse holder is shown in 8. The fuse must be rated 2 A (slow).

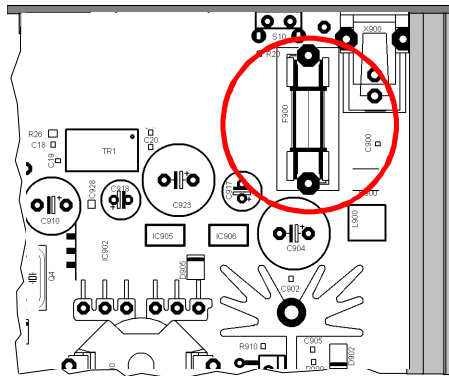


Figure 8: Location of the fuse holder

- ⇒ Unplug the power supply before replacing the fuse!
- ⇒ Ground your hands before touching electronic components inside!
- ⇒ Use only fuses with the appropriate rating!

7. Inputs and IEPE Supply

The M208A has eight identical measuring channels. Sensors are connected via BNC sockets marked “IN” on the front panel. The input impedance is approximately 4 M Ω . The input overload limit is ± 10 V. The inputs can withstand voltages of up to ± 25 V.

For the operation with IEPE sensors constant current sources must be switched to the inputs (see 12.4 on page 31). By default the M208A is equipped with 4 mA constant current sources which is a practical value for most applications. For extremely long sensor cables and high frequencies to be measured, the instrument can also be equipped with 8 mA sensor supplies. The constant current source module can be replaced by the user. Open the cover plate after removing four screws (see 9).

- ⇒ Unplug the power supply before replacing the module!
- ⇒ Ground your hands before touching electronic components inside!

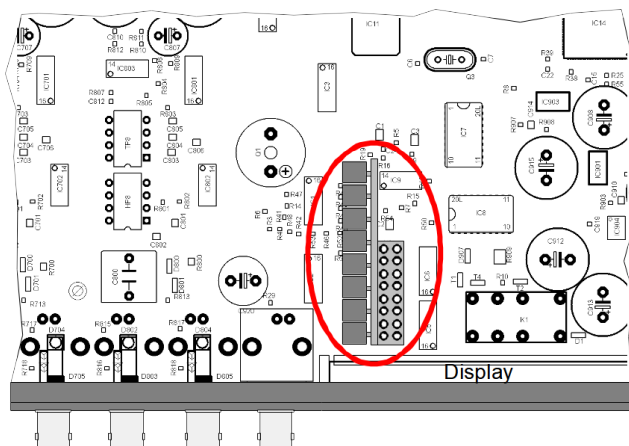


Figure 9: Location of the constant current source module

8. Outputs

The eight outputs are accessible via BNC sockets (“OUT”) on the front panel and a 25 pin Sub-D connector on the rear panel (10).

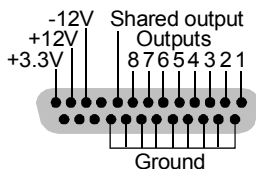


Figure 10: Sub-D output socket

The outputs are short-circuit-proof. Their output impedance is $100\ \Omega$.

In addition to the channel outputs there is a shared output which can be connected to one of the channels. It is accessible via the BNC socket “SWITCHED OUTPUT” on the front panel and the Sub-D connector on the rear panel (10).

The shared output is always switched to the channel which is currently measured. The M208A performs multiplex measurement with an interval of 1 s. Multiplexing may be stopped at a desired channel by pressing the OK key. Then the selected channel is permanently connected to the shared output. Multiplexing can be started by pressing OK again.

The 25 pin Sub-D connector also provides some of the internal DC supply voltages for external purposes. Please make sure not to load these outputs with more than 20 mA each.

9. Grounding and Avoiding Ground Loops

All inputs and outputs are referred to the same ground potential. Ground is also available at the socket (“GND”) on the rear panel.

The negative supply Terminal (-) is also connected to ground.

To prevent ground loops it is recommended that additional connections are not made between the sensor cases via the test object. This can be avoided by using sensors with isolated base or isolating pads which are available as accessory parts.

10. Operation

10.1. Gain Selection

The instrument has four gain ranges of 0, 20, 40 and 60 dB (1, 10, 100 and 1000), which may be set for each channel individually.



Figure 11: Gain selection

Open the gain menu by pushing the “GAIN” key. Select the desired channel (“Channel No.:”) using the ▲▼ and OK keys. Selection “all” will set the gain of channels 1 to 8 simultaneously. After this select the desired gain range in the same way. You may leave the menu without making changes by pressing ESC.

The selected gain ranges are indicated by a combination of LEDs on the front panel for each channel:

- 0 dB: LEDs off
- 20 dB: orange LED (“20”)
- 40 dB: green LED (“40”)
- 60 dB: orange and green LED

10.2. Transducer Sensitivity

10.2.1. Introduction

The purpose of entering transducer sensitivity is to normalize output of the measuring chain, consisting of the sensor and the M208A, to a physical unit. The actual gain of the M208A will not be 0, 20, 40 or 60 dB but an odd value providing a relation between output voltage and measured physical quantity in multiples of ten. This simplifies the interpretation of the measuring signal. Adjusting the readout equipment to the sensor is no longer necessary.

Example: Accelerometer with a sensitivity of 11.2 mV/ms^{-2}

M208A output without normalization:	0 dB $\rightarrow 11.2 \text{ mV/ms}^{-2}$
	20 dB $\rightarrow 112 \text{ mV/ms}^{-2}$
	40 dB $\rightarrow 1.12 \text{ V/ms}^{-2}$
	60 dB $\rightarrow 11.2 \text{ V/ms}^{-2}$
M208A output with normalization:	0 dB $\rightarrow 10.0 \text{ mV/ms}^{-2}$
	20 dB $\rightarrow 100 \text{ mV/ms}^{-2}$
	40 dB $\rightarrow 1.00 \text{ V/ms}^{-2}$
	60 dB $\rightarrow 10.0 \text{ V/ms}^{-2}$

Normalization is done by entering transducer sensitivity in millivolts per mechanical unit. Permissible values are between 1 and 12. At a sensitivity of 1 the M208A works with its basic gain ranges of 0, 20, 40 and 60 dB (1, 10, 100 and 1000) see section 10.1). At the maximum sensitivity value of 12 the resulting gain will be divided by 12. For other sensitivities respective gains will be calculated.

Real transducers do not always have sensitivities between 1 and 12. This is accomplished by shifting the decimal point. By this means the following input ranges for transducer sensitivity are obtained:

- 0.1000 .. 1.2000 mV/mech. unit
- 01.000 .. 12.000 mV/mech. unit
- 010.00 .. 120.00 mV/mech. unit
- 0100.0 .. 1200.0 mV/mech. unit
- 01000 .. 12000 mV/mech. unit

Transducer sensitivity may be entered in different ways:

- Prompt after connecting an IEPE transducer (section 10.2.4 on page 17)
- Entering a value by the sensitivity menu (section 10.2.5 on page 18)
- Automatic reading of the sensitivity from the memory of a TEDS transducer (section 10.2.6 on page 18)
- Programming via the interfaces (section 13 on page 35)

If the sensitivity was entered or detected correctly, the display will immediately start to show values with the selected mechanical units. The amplifier output will provide the normalized signal.

Entering a transducer sensitivity is only possible for channels where a mechanical measuring unit was selected (section 10.4. on page 20). For the measuring unit mV or V only the basic gain ranges of 0, 20, 40 and 60 dB (1, 10, 100 and 1000) are available.

10.2.2. Normalization of the Display

The following table shows the full scale values for different transducer sensitivities and gain ranges for the example of an accelerometer in m/s^2 .

	0 dB	20 dB	40 dB	60 dB
0.1 .. 1.0 mV/ms^{-2} **	100.0 .. 10.0 km/s^2 *	10.00 km/s^2	1000 m/s^2	100.0 m/s^2
1 .. 10 mV/ms^{-2} **	10.00 .. 1.00 km/s^2 *	1000 m/s^2	100.0 m/s^2	10.00 m/s^2
10 .. 100 mV/ms^{-2} **	1000 .. 100 m/s^2 *	100.0 m/s^2	10.00 m/s^2	1.000 m/s^2
100 .. 1000 mV/ms^{-2} **	100,0 .. 10.0 m/s^2 *	10.00 m/s^2	1.000 m/s^2	100.0 mm/s^2
1000 .. 10 000 mV/ms^{-2} **	10,00 .. 1.00 m/s^2 *	1.000 m/s^2	100.0 mm/s^2	10.00 mm/s^2

* At a gain of 0 dB and the maximum transducer sensitivity value the full-scale output is limited to 10 % since the input magnitude cannot exceed 10 V.

** For simplification a transducer sensitivity range of 1 to 10 was assumed. At the actual limits of 1.2 / 12 / 120 / 1200 / 12000 mV/mech. unit the shown full-scale values must be divided by 1.2.

10.2.3. Normalization of the Amplifier Output

If transducer sensitivities have been entered correctly, the amplifier outputs ("OUT") will provide a signal which represents the measured mechanical quantity as a voltage in multiples of ten. The following table shows the measuring ranges in mechanical units (m.u.) for different gain settings and transducer sensitivities.

1V at amplifier output equals ...

	0 dB	20 dB	40 dB	60 dB
0.1 .. 1.2 mV/ms^{-2}	10 000 m.u.	1000 m.u.	100 m.u.	10 m.u.
1 .. 10 mV/ms^{-2}	1000 m.u.	100 m.u.	10 m.u.	1 m.u.
10 .. 100 mV/ms^{-2}	100 m.u.	10 m.u.	1 m.u.	0.1 m.u.
100 .. 1000 mV/ms^{-2}	10 m.u.	1 m.u.	0.1 m.u.	0.01 m.u.
1000 .. 10 000 mV/ms^{-2}	1 m.u.	0.1 m.u.	0.01 m.u.	0.001 m.u.

The mechanical unit represents m/s^2 for accelerometers, N for force transducers, Pa for measuring microphones and kPa for pressure transducers (see also section 10.4 on page 20).

10.2.4. Sensor Detection

The M208A automatically detects a connected sensor at its inputs. This detection is based on the transducer bias voltage (see section 3 on page 7).

Please note:

- ⇒ Sensor detection only functions if display multiplexing is active. Before connecting the sensor the display must show: “OK: Stop rot.”. Multiplexing is started and stopped by the OK key.
- ⇒ Sensors can only be detected if the corresponding channel is active (section 10.3 on page 19).
- ⇒ For sensor detection the IEPE supply of the respective channel must be switched on (section 12.4 on page 31).
- ⇒ Please do not connect several sensors at once. Connect them one by one and wait until each sensor is detected.
- ⇒ Deactivation of unused channels is recommended to avoid interference (section 10.3 on page 19).

When the M208A detects the connection of a new sensor, it will show the message “New sensor detected” and ask the user to enter the sensitivity. Sensitivity is entered with five digits and a decimal point in millivolts per mechanical unit. Default value is the previously entered sensitivity for this channel.

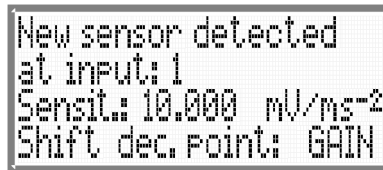


Figure 12: Sensor detection and sensitivity entry

Numbers are entered by the ▲▼ keys. Use the ◀ ▶ keys to change between the digits. The decimal point is shifted by pressing the GAIN key. Press OK to confirm the entry.

Only numbers between 1000 and 12000 are accepted, regardless of the decimal point position. Please shift the decimal point so that the resulting value is in the permissible range.

Example: Sensitivity: 92.5 mV/ms^2	→ Entry: “092.50”
Sensitivity: 125.56 mV/ms^2	→ Entry: “0125.6”

Notice: Sensitivities between 1 and 1.2, 10 and 12, 100 and 120 etc. can be entered in two ways.

The example shows this for 1.1 mV/ms⁻², 11 mV/ms⁻² and 110 mV/ms⁻².

Alternative 1: 01.100 / 011.00 / 0110.0 mV/ms⁻²

Alternative 2: 1.1000 / 11.000 / 110.00 mV/ms⁻²

The first alternative should be preferred since the total gain of the amplifier will be ten times higher in this case which will improve accuracy.

10.2.5. Entering Transducer Sensitivity in the Menu

Transducer sensitivity may be entered manually via the sensor menu which opens after pressing the SENSOR key. Select the desired channel using the ▲▼ and OK keys. Enter the sensitivity as described above.

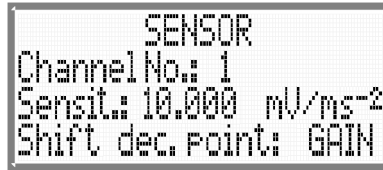


Figure 13: Entering transducer sensitivity

10.2.6. Automatic Sensitivity Adjustment with TEDS Sensors

The M208A will automatically detect the connection of a TEDS sensor (see section 4 on page 8) and read out its sensitivity. It will prompt “TEDS Sensor at Ch. ...”, show TEDS version, template number, model number and, if applicable, the direction (X/Y/Z).

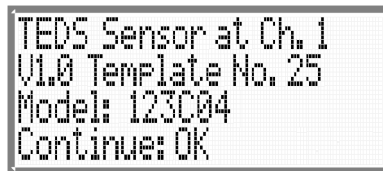


Figure 14: TEDS detection

After pressing OK the display shows the serial number, the measuring ID and the first 15 letters of the user text stored in the TEDS memory. Sensitivity is shown in the third line. Press OK to accept this sensitivity or skip normalization by pressing ESC.

```

Ser:00000514 ID:2047
Text:
Sensit.: 19.260 mV/ms²
Accept:OK Quit:ESC

```

Figure 15: TEDS sensitivity display

If the sensitivity stored in the TEDS memory should exceed the permissible limits of the M208A (0.1 to 12000 mV/mech. unit), an error message “TEDS sensitivity out of range” will appear.

Any other parameters stored in the TEDS memory (see section 4 on page 8) will not be used by the M208A.

The instrument supports the TEDS templates no. 25 for accelerometers and force transducers and no. 27 for measuring microphones. Other TEDS templates lead to the error message “TEDS incompatible”.

Erroneous TEDS data will cause the error message “TEDS Checksum error”.

10.3. Channel Registration

The measuring display can be activated separately for each channel. A deactivated channel is skipped in the multiplexed display mode. New sensors will not be detected for deactivated channels (compare section 10.2.4 on page 17). For channel registration press the MENU key and select “4/6: Channel on/off”.

```

CHANNELS ON/OFF
1 2 3 4 5 6 7 8
○ ● ● ● ● ● ● ●
Change: ↑↓↔ Enter:OK

```

Figure 16: Channel registration

Use the keys ▲▼◀▶ to deactivate (○) or activate (●) the respective channel. Confirm by OK or quit without changes by ESC.

Channel registration only concerns the display. The respective amplifier channel will continue to work normally.

- ⇒ Automatic sensor detection only works for registered channels.
- ⇒ Deactivate the measuring display of unconnected channels.

10.4. Measuring Unit

The measuring display can show individual measuring units for each channel. The unit can be electrical (mV / V) or mechanical, depending on the connected sensor:

- m/s^2 (accelerometer, also for velocity and displacement when using integrators)
- N (force transducer)
- Pa (measuring microphone)
- kPa (pressure transducer)

Open the menu “2/6: Display unit” to select the desired channel or all channels of the instrument and the measuring unit using the keys ▼▲ and confirm with OK.

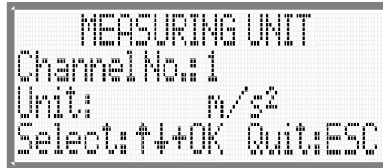


Figure 17: Selecting measuring units

- ⇒ After changing the measuring unit, the transducer sensitivity of the respective channel will be reset to “0.1000”.
- ⇒ If a measuring channel is equipped with an integrator module (section 11 on page 24), the displayed measuring unit will always be $\mu\text{m/s}$, mm/s or m/s for single integration and μm , mm or m for double integration.
- ⇒ If the selected measuring unit is volts, transducer normalization is not possible. The respective channel works with the basic gain ranges 0, 20, 40 or 60 dB (1, 10, 100 or 1000).

10.5. Display Mode

The M208A can display the amplifier output as true RMS or peak values. Measuring time is 1 s per channel. Open the menu “3/6: Display mode” to choose between the two modes and press OK to confirm.

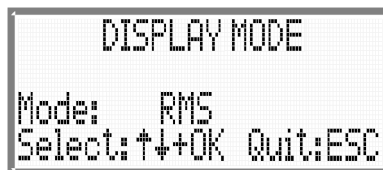


Figure 18: Selecting the display mode

The selection is used for all channels.

10.6. Measuring Display

The measuring display is the normal operation mode of the M208A. Measuring values are displayed in rotation for the active channels, i.e. if a channel was activated (section 10.3 on page 19) and a sensor was detected at the respective input (section 10.2.4 on page 17).

Rotation (or multiplexing) can be stopped by pressing the OK key and started by pressing the same key again.

- ⇒ Each request received via the Ethernet interface will set the display to the rotating mode. This ensures that all measuring results are available for the client.

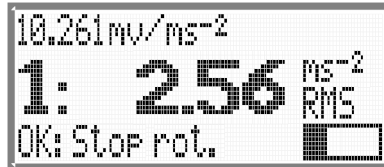


Figure 19: Measuring display

On the left of the measuring value you see the channel number. On the right measuring unit and display mode appear. The display unit will be V or mV if voltage was selected as measuring unit or the selected mechanical unit. (section 10.4 on page 20). In the upper line you see the transducer sensitivity alternating with the filter frequencies. In the lower right corner are the relative magnitude bar graph and the overload indicator (sections 10.7 and 10.8).

- ⇒ Important: Deactivate channels with open inputs to avoid interference (section 10.3 on page 19).

10.7. Relative Magnitude and Overload Indication

In measuring mode the display shows a bar graph for the relative magnitude of the current channel.

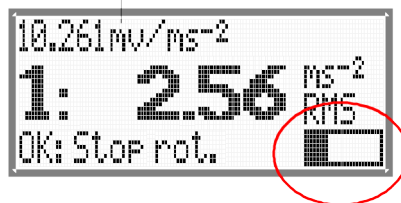


Figure 20: Relative magnitude display

If the magnitude drops below 5 % of the full-scale value, a warning message “<5 %” will appear instead of the bar graph. In this case the gain should be increased (see section 10.1 on page 14).

If the magnitude reaches 90 % of the full-scale value, a message “OVERLOAD” is displayed instead of the measuring value. The gain must be reduced (see section 10.1 on page 14). Overload is also indicated for each channel by a red LED (“OVL”).

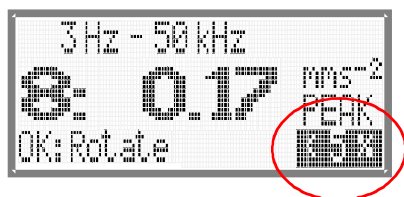


Figure 21: Low output warning

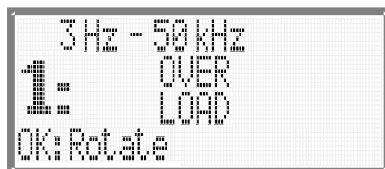


Figure 22: Overload indication

The overload limit is adjustable. It can be adapted to equipment connected to the amplifier outputs (section 12.7 on page 32).

If the relay output was triggered, the message “Alarm” will appear instead of the overload indication (section 10.8).

10.8. Relay Output

The relay output of the M208A can control external alarm devices. It has a potential free change-over contact which is connected to the 25 pin Sub-D socket on the rear panel. 23 shows the pin assignment for alarm condition.

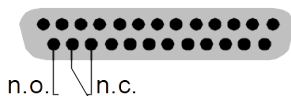


Figure 23: Relay output in alarm condition

In the menu “5/6: Alarm relay” you can select which channels will control the relay.

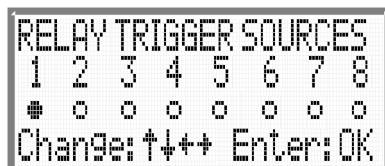


Figure 24: Channel selection for the relay output

Use the keys ▲▼◀▶ to deactivate (○) or activate (●) the channels for relay control. In the subsequent menu you will be asked to enter a trip limit for each activated channel.

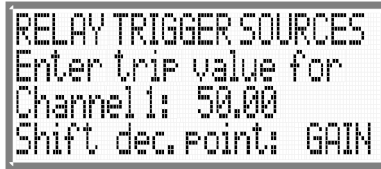


Figure 25: Entering relay trip limits

Numbers are entered by the keys ▲▼. Switch between the digits using the keys ◀▶. The decimal point can be shifted by the GAIN key. Press OK to confirm.

If the displayed value exceeds the entered limit, the relay will switch immediately. It doesn't matter whether RMS or peak values, voltage or mechanical units are displayed. Only the numerical part is compared.

An overload message will also trigger the relay even if the theoretical measuring value would be below the trip value.

If the relay output was triggered, the message “Alarm” will appear in the lower right corner of the measuring display for the respective channel. However, this only happens if channel rotation is active (OK key).

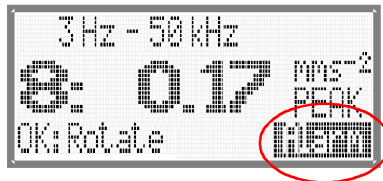


Figure 26: Alarm display

The measuring value and the relay trip value are only compared while the channel is displayed. Minimum alarm delay time is a few milliseconds. The maximum delay is one display cycle for eight channels, i.e. eight seconds.

When the measuring value drops below the relay trip value, the alarm message will disappear and the relay switches back, provided that no other channel triggers it. Minimum hold time is therefore between one second for one active channel and eight seconds for eight channels.

The contact position shown in 23 is the alarm condition. This is the switch position for a current-less relay coil. This assures that the relay will also indicate an alarm at a power supply failure.

11. Filters and Integrators

11.1. Filters

The M208A has replaceable high pass and low pass filter modules. The following frequencies are available:

High pass filters:		Low pass filters:	
3 dB frequency limit	Model	3 dB frequency limit	Model
3 Hz	FB3-3Hz	0.1 kHz	FB2-0.1kHz
5 Hz	FB3-5Hz	0.3 kHz	FB2-0.3kHz
10 Hz	FB3-10Hz	0.5 kHz	FB2-0.5kHz
30 Hz	FB3-30Hz	1 kHz	FB2-1kHz
50 Hz	FB3-50Hz	3 kHz	FB2-3kHz
100 Hz	FB3-100Hz	5 kHz	FB2-5kHz
300 Hz	FB3-300Hz	10 kHz	FB2-10kHz
500 Hz	FB3-500Hz	30 kHz	FB2-30kHz
1000 Hz	FB3-1000Hz	50 kHz	FB2-50kHz
		100 kHz	FB2-100kHz*

* With the low pass FB2-100kHz at 60 dB gain and frequencies over 50 kHz the output peak voltage should not exceed $\pm 3V$ to avoid distortion.

The high pass modules are second order Butterworth filters. The low pass modules are fourth order Butterworth filters.

The following diagrams show the frequency and phase response curves of the high pass and low pass filters.

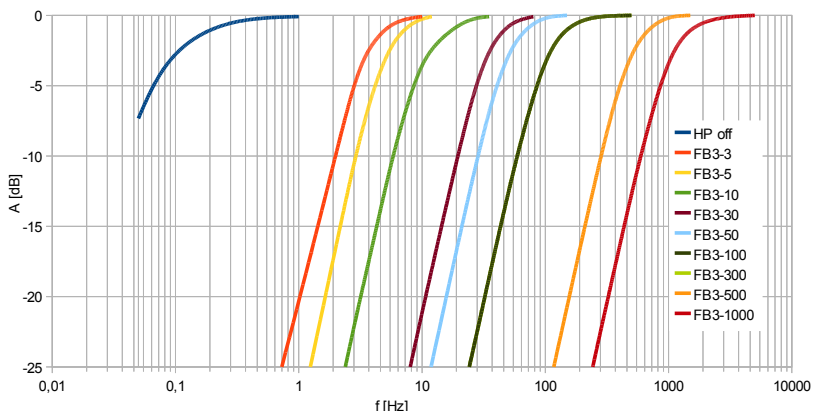


Figure 27: Frequency response of M208A with different high pass filters FB3-...

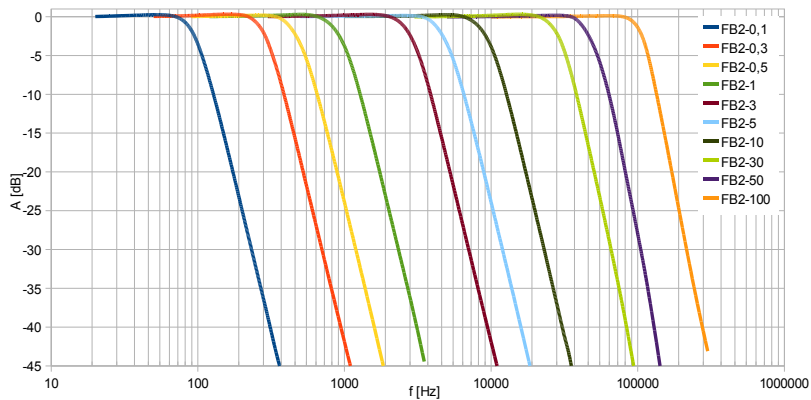


Figure 28: Frequency response of M208A with different low pass filters FB2-...

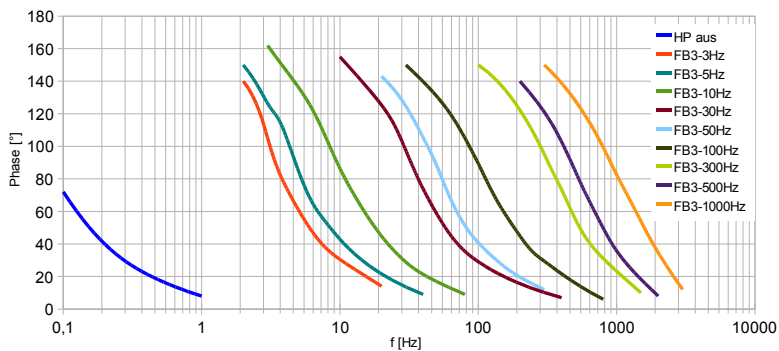


Figure 29: Phase response of M208A with different high pass filters FB3-...

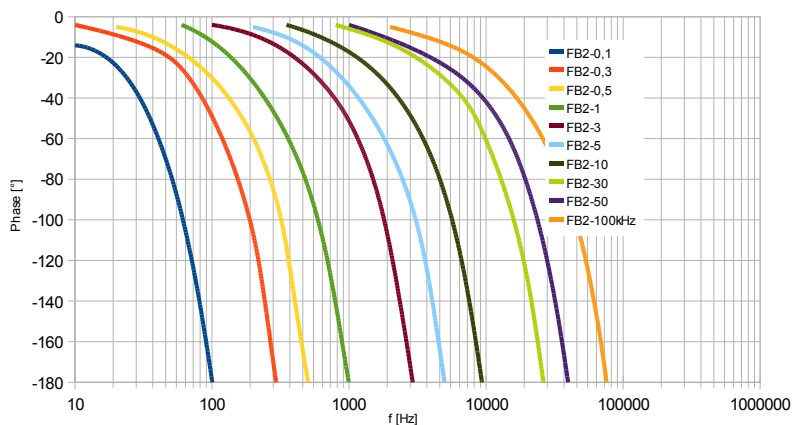


Figure 30: Phase response of M208A with different low pass filters FB2-...

11.2. Integrators

Integrators are useful to calculate vibration velocity or displacement from an acceleration input.

Single or double integrator modules can be plugged in instead of filters. Mixed filter operation is also allowed.

The single integrator FBV includes a second order 3 Hz high pass filter.

The double integrator FBD includes a second order 5 Hz high pass filter.

Figures 31 and 32 show the frequency response curves of the integrators.

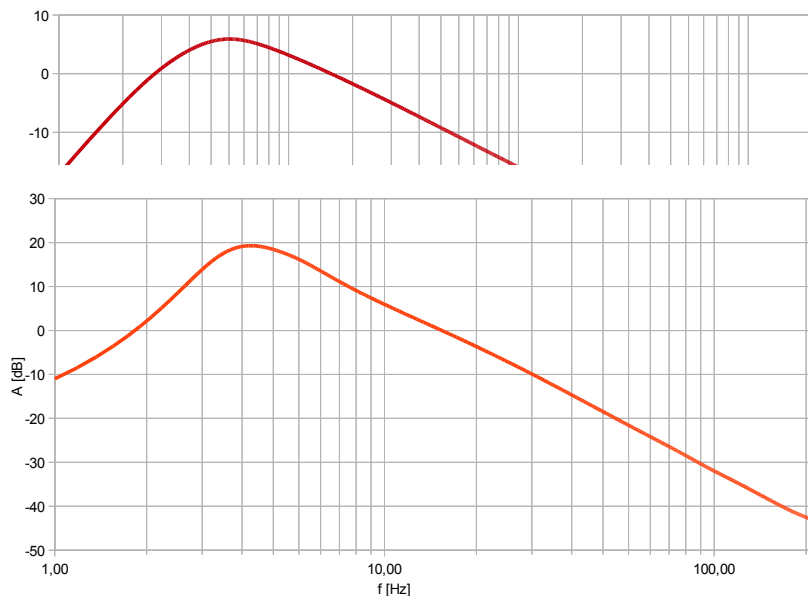


Figure 32: Frequency response of the M208A with the double integrator FBD

The following explanation is given to understand the relationship between the measured mechanical quantity and the integrated output of the M208A with an accelerometer:

The calculations show how the M208A output \mathbf{u}_{out} corresponds to the three vibration quantities. The selected gain range of the M208A is \mathbf{G} (1, 10, 100 or 1000) and the accelerometer sensitivity (see transducer data sheet) is \mathbf{B}_{aa} .

Vibration acceleration a (without integration):

$$a = \frac{u_{out}}{G \cdot B_{ua}}$$

(a in m/s²; u_{out} in mV; B_{ua} in mV/ms⁻²)

Vibration velocity v (single integration):

$$v = \frac{u_{out}}{G \cdot B_{ua}} \cdot 10 s$$

(v in mm/s; u_{out} in mV; B_{ua} in mV/ms⁻²; s = seconds)

Vibration displacement d (double integration):

$$d = \frac{u_{out}}{G \cdot B_{ua}} \cdot 100 s^2$$

(d in μm; u_{out} in mV; B_{ua} in mV/ms⁻²; s = seconds)

Example:

Vibration velocity is measured using an accelerometer with a sensitivity of B_{aq} = 5 mV/ms⁻². The M208A is operated in the range G = 100. Its output voltage is 300 mV_{ms}. What is the corresponding vibration velocity?

Solution:

$$v = \frac{300 mV}{100 \cdot 5 mV/ms^{-2}} \cdot 10 s = 6 mm/s_{eff}$$

When a direct connection between the output voltage of the M208A and the measured physical quantity should be desired (for example “1 mV corresponds to 1 mm/s”), you may may normalize the M208A gain to the transducer sensitivity (see section 10.2 at page 14).

The frequency range is limited to approximately 6 to 2000 Hz for single integration and 6 to 200 Hz for double integration. At the upper end of the frequency range only a poor signal-to-noise ratio can be achieved. This is the consequence of the frequency characteristic of electronic integrators.

⇒ It is not recommended to switch off the high pass function (see section 11.5) if integrator modules are used. The high pass filters inside the integrator modules have been designed in order to suppress low frequency noise which would appear at the amplifier output.

11.3. Replacing Filter and Integrator Modules

For replacing filters or integrators, remove the four screws of the cover plate and open the case.

- ⇒ Unplug the power supply before replacing filters!
- ⇒ Ground your hands before touching electronic components inside!

33 shows the filter and integrator modules. Each channel has a high pass and a low pass module. Instead of the high pass and a low pass module an integrator module can be inserted. Pull out the modules carefully without bending their pins. When in-

serting the filter or integrator, make sure that the “Pin 1” mark (▼) faces to the correct side.

For proper function of the M208A it is necessary that all filters or integrators are inserted.

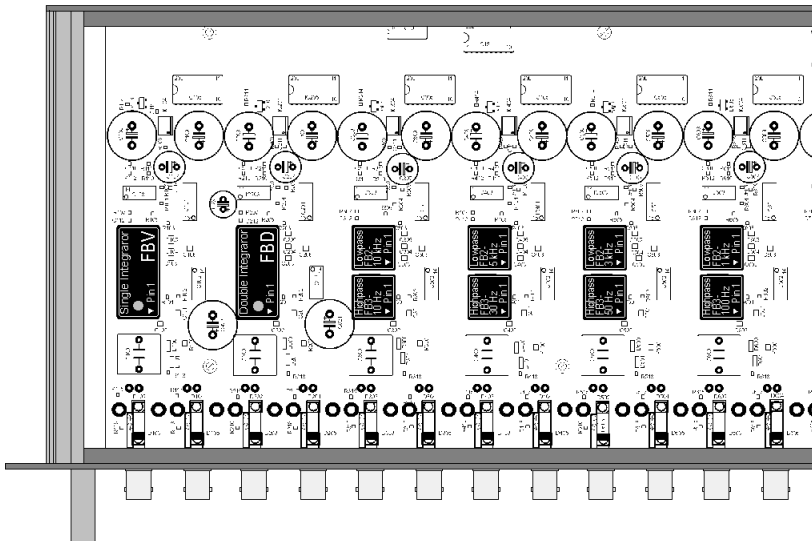


Figure 33: Location of the filter and integrator modules

11.4. Entering Filter Frequencies or Integrators

The used plug-in filter or integrator modules can be entered via a menu. Entering the module types is necessary to display the correct corner frequencies or, with integrators, the correct measuring units. These settings do not influence the signal path in any way.

Press the MENU key, select “1/6: Filter setup” and the sub-menu “1/2: Filter modules”. Confirm the warning message by OK. Now the low pass and high pass frequencies are entered one after another for channels 1 to 8. In the low pass menu you may also select a single integrator (module FBV) or double integrator (FBD). In this case the high pass menu is skipped for the respective channel.

Only the standard filter series with values of 1, 3, 5, 10 etc. can be entered.

The filter menu can be left at any time by pressing ESC.

The selection of an integrator module will change the displayed measuring unit automatically to $\mu\text{m/s}$, mm/s or m/s for single integration and nm , μm or mm for double integration. It is assumed that integration is only useful in combination with accelerometers.

When all modules are entered the filter frequencies or integrators will be displayed in the measuring mode above the measuring value, alternating with the transducer sensitivity (if entered). If no filters or integrators are displayed, the M208A remains in reset condition with undetermined filters.

11.5. Switching Off the High Pass Filters

The high pass filters can be switched off separately for each channel. The M208A will then work with its lower frequency limit of approximately 0.1 Hz. Press the MENU key, select “1/6: Filter setup” and the sub-menu “2/2: Highpass on/off”. Use the keys ▲▼◀▶ to switch off (○) or activate (●) the high pass filter for the respective channel. Confirm with OK or press ESC to quit without changes.

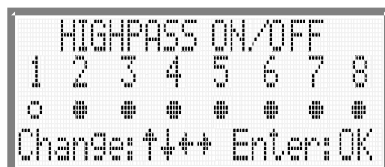


Figure 34: Switching high pass filters on or off

If a high pass filter is switched off, the display will show “0.1 Hz” instead of the plugged in module frequency.

- ⇒ Notice: When the high pass filter is switched off, low frequency noise from the sensor electronics and the constant current source may pass the signal path. It may appear as a fluctuating voltage at the amplifier output.
- ⇒ It is not recommended to switch off the high pass function if integrator modules are used. The high pass filters inside the integrator modules have been designed in order to suppress low frequency noise which would appear at the amplifier output.

12. Other Settings

12.1. Beep

The beep sound, used for keystroke, overload and errors, can be switched off in the menu “6/6: Div. settings” and the sub-menu “1/9: Beeper on/off”.

12.2. Serial Interface

The baud rate of the serial interface can be selected in menu “6/6: Div. settings” and sub-menu “2/9: Serial Interf.”. Before changing the baud rate you are informed that the Ethernet interface will be disabled and the serial interface enabled when making this setting.

Please check also that the following settings have been made for the COM interface of your PC:

- 7 data bits
- 1 stop bit
- even parity
- no flow control

12.3. Ethernet Interface

The TCP/IP settings of your M208A can be entered in menu “6/6: Div. settings” and sub-menu “3/9: Ethernet”. More details can be found on page 52. Before chang-

ing the baud rate you are informed that the serial interface will be disabled and the Ethernet interface enabled when making this setting.

12.4. Switching the IEPE Supply On or Off

IEPE transducers need a constant current supply for operation (compare section 3 on page 7). For measurements with other sensor types or for using the M208A as AC amplifier, it may be necessary to switch off the constant current sources. This can be done for each channel separately. Open the menu “6/6: Div. settings” and the sub-menu “4/9: IEPE on/off”.

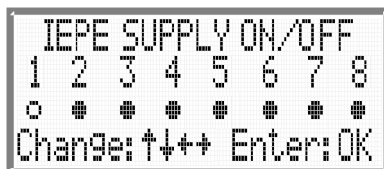


Figure 35: Switching the IEPE supply on or off

Use the keys ▲▼◀▶ to disable (○) or enable (●) the constant current source of the respective channel. Confirm with OK or press ESC to quit without changes.

For channels with switched off IEPE supply, the display will show in measuring mode “IEPE off” in place of transducer sensitivity. When the IEPE supply is switched off, the measuring unit changes to V or mV and transducer sensitivity is reset to “0.1000”. Thus the M208A works as voltage amplifier with the gains 0 / 20 / 40 / 60 dB. Sensor detection is disabled and the yellow LED is off.

If an integrator module was plugged in and detected, the measuring unit of vibration and the transducer sensitivity will not be changed even if the IEPE supply is switched off for the respective channel.



Figure 36: Measuring display with disabled IEPE supply

- ⇒ It is recommended that the IEPE supply of unused channels be kept switched on in order to terminate the inputs. Otherwise electromagnetic interference via the unterminated inputs could induce noise in other channels.
- ⇒ Switch off the measuring display of unused channels (see section 10.3 on page 19).

12.5. Instrument Name

You may give your M208A a name of up to 20 characters length. It may give information about its location or the test object, for example. This name will appear after pressing the key ◀ in measuring mode, in the headline of the HTML page hosted by the M208A and in the instrument settings downloaded via the serial interface.

12.6. Loading Default Settings

The M208A can be reset to its factory default settings in the menu “6/6: Div. settings” and the sub-menu “7/9: Load defaults”. The following settings will be changed:

- Instrument name “IEPE AMPLIFIER”
- Gain for all channels 0 dB
- Measuring display for all channels activated
- Measuring unit V
- Transducer sensitivities “0.1000”
- High pass filters on
- IEPE constant current sources on
- Sensor overload limit 5 V_{peak}
- Output overload limit 10 V_{peak}
- Relay trip value “9999”
- Filter modules “undetected” (no display of filter frequencies)
- Serial interface activated with 57600 Baud
- IP address 192.168.181.30, subnet 255.255.255.0, Ethernet off

12.7. Overload Limits

The M208A signal path has a dynamic range of ± 10 V. At 90 % of this magnitude the display and the red LEDs will indicate overload accompanied by a beep sound (see section 12.1 on page 30 for deactivation).



Figure 37: Overload indication

It may be desirable to reduce the overload indication limit, for example, if a data acquisition board with an input range of ± 5 V is connected to the M208A outputs.

To change the overload limit, enter the menu “6/6: Div. settings” and the sub-menu “8/9: Overload limits”. At first you are asked to enter the output overload limit. It can be selected in steps of 1 V by the keys ▼▲. Minimum value is 3 V. Overload is indicated above 90 % of the entered value.

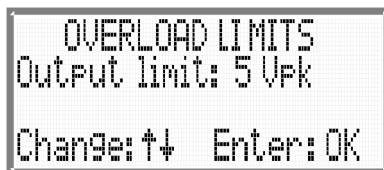


Figure 38: Output overload limit

After this you may enter a different overload limit for the sensor inputs. Maximum input magnitude of the M208A is ± 10 V. However, most IEPE transducers will not

reach this magnitude. The dynamic range can be found in the transducer data sheet. Therefore it is useful to enter a lower input overload limit. This is done in the same way as for the outputs.

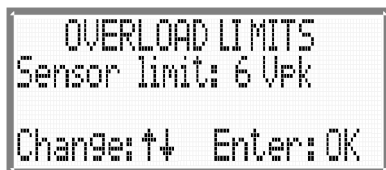


Figure 39: Input overload limit

- ⇒ Input overload is only monitored if the IEPE supply was enabled for all channels (see section 12.4 on page 31).

The entered overload limits are valid for all channels.

12.8. Firmware Update

This function is used to replace the instrument's firmware with a newer version.

⇒ Use this function carefully! All settings you have made will get lost. Before starting the update process, the old firmware will be erased. Consequently the instrument will not function until installing new firmware.

Please go to our web site

http://www.mmf.de/software_download.htm

to check availability of a newer firmware version than the one installed on your M208A. You may check the installed version by pressing the key ◀ in the measuring mode (section 16 on page 56).

At first you need to download the program “MMF Firmware Updater” and to install it on your PC. This update utility runs under Windows 2000, XP and Vista.

After this, download the firmware file M208.hex and save it in your working directory.

Connect the socket “RS-232 MASTER/PC” of your M208A via a serial interface cable to your PC. If your PC has no serial interface, you may use an USB/RS-232 converter. Please verify that this converter is recognized as COM port in the device manager of your PC.

Start the “MMF Firmware Updater” from the Windows start menu.

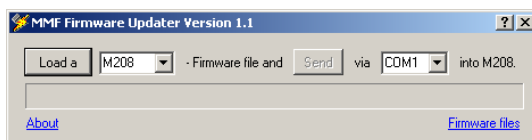


Figure 40: Firmware update utility

Select the instrument name (M208) from the pull-down menu.

Click the button “Load a” and load the firmware file M208.hex from your working directory.

Select the COM port of your PC where you have connected the cable or the USB converter.

At the M208A select the menu “6/6: Div. settings” and the sub-menu “9/9: Firmware update”. If you confirm the subsequent warnings by OK, the old firmware will be erased and the M208A will be waiting for data from the serial interface.

Click the “Send” button in the firmware updater utility. The update takes two to three minutes. Progress is indicated at the M208A by the LEDs flashing up in intervals of eight seconds.

⇒ The update process must not be interrupted!

Reception errors are signaled by three short beep tones from the M208A. The update program will continue to send data until the firmware file is completed. If an error has occurred, press the RESET button on the rear panel which puts the M208A into reception mode again. Restart the firmware update utility.

A successful update is indicated by a PC message.

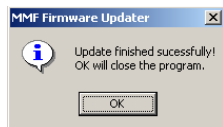


Figure 41: Update successful

The M208A will restart automatically. Serial number / MAC address and calibration are not changed by a firmware update.

13. PC Connection

13.1. Serial Interface

13.1.1. Settings

Communication via the serial interface can take place with the supplied PC control software (section 13.1.3). Alternatively, the M208A can be linked with other software using a set of ASCII commands (section 13.1.4).

The following settings are required for the serial interface:

- 19200 .. 115200 Bits/s (compare section 12.2 on page 30)
- 7 data bits
- 1 Stop bit
- even parity
- no flow control

The serial interface is activated in menu “6/6: Div. settings” / “2/9: Serial Interf.”. At the same time the Ethernet interface will be disabled.

Serial communication with the M208A is only possible in measuring mode. No communication takes place when menus are opened at the addressed M208A or an upstream unit in the chain.

13.1.2. Linking Several M208A Units

Up to eight M208A units can be controlled by one serial interface. The units are interconnected using a “daisy chain” network. The first unit in the chain is connected to the PC via its “MASTER” interface. The second M208A is connected with its “MASTER” interface to the “SLAVE” interface of the first unit, and so on (see 42). The interconnected M208A units are seen from the PC as one signal conditioner with up to 64 channels. The individual instruments do not have specific addresses. Their channel numbers result from their position in the chain.

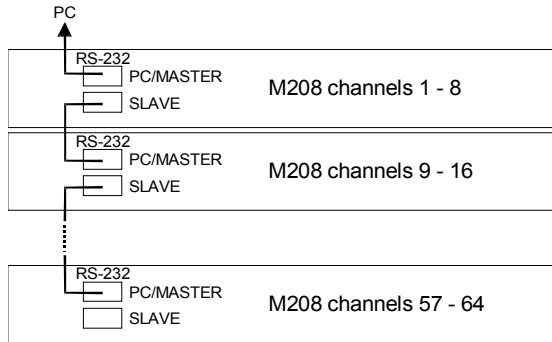


Figure 42: Interconnection via serial interfaces

Notice: This kind of networking is not possible with the Ethernet interface.

13.1.3. PC Software M208 Control Center

13.1.3.1. Introduction

The software M208 Control Center supplied with the instrument is intended for remote control of up to eight units via an RS-232 serial interface or a RS-232 / USB adapter.

It allows the following operations:

- changing basic settings such as instrument name or display mode
- changing channel settings like gain, display unit or sensitivity
- reading and writing TEDS information of connected sensors (optional)
- simple vibration monitoring (optional).

13.1.3.2. System Requirements

The program requires for installation:

- A PC with Windows 2000, XP or Vista
- Microsoft NET.Framework 2.0 (will be downloaded automatically)
- Internet access (for installing required software components)
- RS-232 interface or RS-232 / USB adapter
- One to eight daisy-chained M208A instruments. Operation via separate serial interfaces is not supported. The software communicates only via one selectable interface with the M208A units.

Although it has been tested carefully, communication may fail under particular conditions. Please make sure that:

- If a RS-232 / USB adapter is used at different USB ports, it is given a new port number each time (COM1 ... COMn). It is recommended therefore to use always the same USB port.
- Please do not alter the serial port numbers (COM1 ... COMn) manually in the Windows device manager.

- Restart the program after connecting a new RS-232 / USB adapter or changing its settings.
- Please connect only one RS-232 / USB adapter to your PC.

13.1.3.3. Controls and Functions

The program is divided into four sections (43).

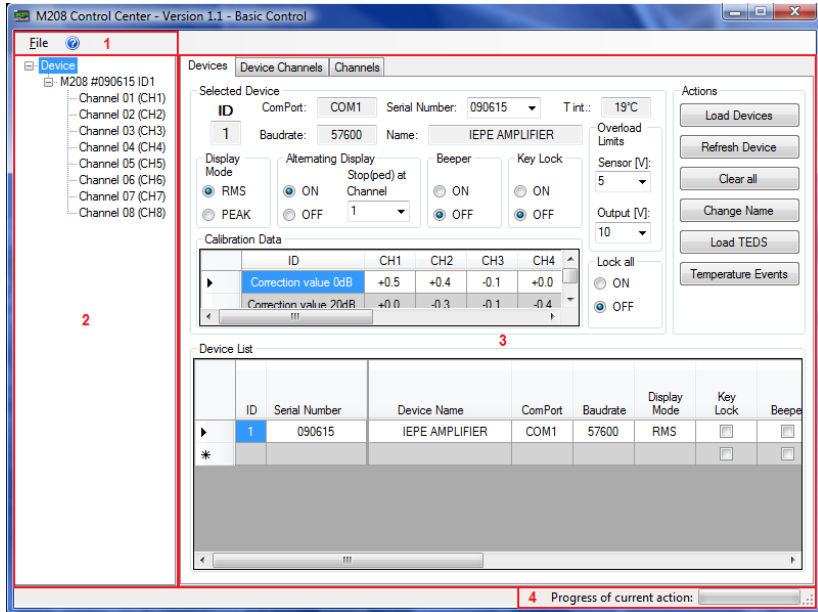


Figure 43: Functional sections

1. Menu bar with main menu (File)
In the file menu you find the sub-menu Settings which opens the setup window. Clicking Exit will save all settings and close the program.
2. Device Tree
This section shows all connected M208A units and their channels. A mouse click on an M208 entry or a channel will open the respective setup window.
3. Tab controlled menus with device and channel settings and optional modules as described in the following chapters.
4. Status bar indicating the progress of the current activity.

13.1.3.3.1 Device Menu

44 shows the menu for general settings of the M208A.

The 'Selected Device' section (B) contains the following controls:

- Selected Device:** ID 1, ComPort: COM1, Serial Number: 090615, T int.: 21°C.
- Baudrate:** 57600, **Name:** IEPE AMPLIFIER.
- Display Mode:** RMS (selected), PEAK.
- Alternating Display:** ON (selected), OFF. Stopped at Channel 1.
- Beeper:** OFF (selected), ON.
- Key Lock:** OFF (selected), ON.
- Overload Limits:** Sensor [V]: 5, Output [V]: 10.
- Lock all:** OFF (selected), ON.
- Calibration Data:**

	ID	CH1	CH2	CH3	CH4
Correction value 0dB		+0.5	+0.4	-0.1	+0.0
Correction value 20dB		+0.0	-0.3	-0.1	-0.4

The 'Actions' section (A) contains the following buttons:

- Load Devices
- Refresh Device
- Clear all
- Change Name
- Load TEDS
- Temperature Events

The 'Device List' section (C) contains a table with the following data:

ID	Serial Number	Device Name	ComPort	Baudrate	Display Mode	Key Lock	Beeper
1	090615	IEPE AMPLIFIER	COM1	57600	RMS	<input type="checkbox"/>	<input type="checkbox"/>

Figure 44: Device menu

It is divided into the action menu (A), the device settings (B) and a table with present devices (C).

Menu Actions

The 'Actions' section contains the following buttons:

- Load Devices 1
- Refresh Device 2
- Clear all 3
- Change Name 4
- Load TEDS 5
- Temperature Events 6

Figure 45: Actions menu

1. Load Devices

You must click this button when you start the program for the first time. The program will try to detect M208A units at the selected RS-232 port with the selected baud rate. The following buttons will be activated if at least one unit was detected.

2. Refresh Device

This reloads the device and channel data of the selected device. It is recommended to do this after changing settings manually at the M208A front panel.

3. Clear all

This will reset the program and erase all settings in the software (not in the M208A).

4. Change Name

This opens an input window for the device name with up to 20 characters (capital letters A to Z, numbers 0 to 9 and space).

5. Load TEDS

This function will scan all inputs for TEDS transducers (Transducer Electronic Data Sheet). If available, the TEDS raw data is stored for further use.

6. Temperature Events

Temperature (minimum or maximum threshold exceeded) events are displayed here if temperature monitoring is activate (see settings, section 13.1.3.3.4).

Menu Selected Device

Selected Device

ID 7 ComPort: COM1 Serial Number: 090615 9 T int.: 24°C 11

1 Baudrate: 57600 Name: 10 IEPE AMPLIFIER

Display Mode 12: ☒ RMS ☐ PEAK

Alternating Display 13: ☒ ON ☐ OFF Stop(ped) at Channel 1

Beeper 14: ☐ ON ☒ OFF

Key Lock 15: ☐ ON ☒ OFF

Calibration Data

	ID 18	CH1	CH2	CH3	CH4
Correction value 0dB	+0.5	+0.4	-0.1	+0.0	
Correction value 20Hz	+0.0	-0.3	-0.1	-0.4	

Overload Limits 16: 5

Sensor [V]: 10

Output [V]: 10

Lock all 17: ☐ ON ☒ OFF

Figure 46: Selected Device menu

7. ID

Here you see a device number given by the software to the respective M208A. Numbering starts at the first instrument in the chain. This entry cannot be edited.

8. ComPort and Baud rate

These are the settings of the serial interface you are using for communication. A mouse click on these settings will open a setup window. The interface settings are equal for all units in a chain.

9. Serial Number

This is the serial number of the M208A being displayed. You can click on the entry to switch to another unit.

10. Name

The name of the active M208A is displayed. Click on the entry to change the name (up to 20 characters, capital letters A to Z, numbers 0 to 9 and space).

11. Internal Temperature

Temperature measured inside of the M208A case. The background will change its color if a temperature limit was exceeded (see settings, section 13.1.3.3.4).

12. Display Mode

Change between RMS and peak display.

13. Alternating Display

The alternating measuring display at the M208A may be either stopped at a desired channel or activated. Please note that the alternating display will be enabled automatically by opening the Device Channels tab.

14. Beeper

Switches the beeper inside the M208A on or off.

15. Key Lock

Locks or enables the keys of the M208A front panel. Please note that the keys can only be enabled via the software. To enable them at the device you must push the RESET button.

16. Overload Limits

Here you can change the overload thresholds for the inputs (sensors) and the outputs. The values are the same for all channels of an M208A.

17. Lock all

This will lock the setup menus of the software in order to avoid unwanted changes.

18. Calibration Data

The table shows the calibration data of the channels of the active unit (format see section 13.1.4.3. on page 51). The values cannot be changed here.

Menu Device List

This table with all connected M208A units shows you their most important settings at a glance. By a mouse click on particular cells you can change some settings.

13.1.3.3.2 Device Channels

This tab shows you all channel settings of the selected unit (47). When this tab is opened, all settings are reloaded from the M208A. A refresh will take place according to the time interval selected in the settings menu. Please note that activating the Device Channels tab automatically starts the alternating display at the M208A.

Figure 47: Device channels

In 48 you see the channel settings using the example of channel 1.

Figure 48: Channel settings

1. Channel

The channel number is displayed in the form XX – CHY, where XX is a consecutive number of all available channels from 01 to 64 and Y is the channel number of the selected M208A, i.e. 1 to 8. The channel number cannot be edited.

2. Filter

Here the frequency range of the plugged in high pass and low pass modules or single / double integrators appears. The display “undefined” means that filter detection has not yet been performed (section Fehler: Verweis nicht gefunden on page Fehler: Verweis nicht gefunden).

3. Measuring Display

This is the RMS or peak measuring value calculated by the M208A. The value is held till the next refresh. The refresh rate can be changed in the File / Settings menu. Please note that the M208A provides only one measuring value per second. So measuring all eight channels will take eight seconds.

The measuring values are displayed in different colors:

Black: Value was just read while the alarm function was switched off

Gray: Value is held

Red: Value was just read and has triggered an alarm

Dark red: Value is held after it triggered an alarm

Green: Value was just read and was below the alarm threshold

Dark green: Value is held after it was below the alarm threshold

Other outputs are OVERLOAD, IEPE Short (input shorted) and OFF (channel switched off or no sensor detected).

4. Level Indicator

The level indicator helps to select the optimum gain range. It can have the following colors:

Yellow: The level is below 5 % of full scale. Increase gain by at least 20 dB.

Green: The level is in the optimum range between 5 and 90 % of full scale.

Red: The level is above 90 % of full scale. Reduce gain by at least 20 dB.

5. Gain

This menu shows the selected gain range of the channel. Changing this entry will set a new gain in the M208A.

6. High Pass Filter

You may switch on or off the high pass filter here.

7. Display Unit

This menu shows the selected measuring unit. The following units are available:

Voltage in V

Acceleration in m/s^2

Force in N

Pressure in Pa

If you select Volts as unit, transducer sensitivity will be reset to 0.1000 automatically.

8. Sensitivity

Transducer sensitivity can be entered to normalize amplifier outputs and display to the measured mechanical unit. Sensitivity can only be changed for the display of mechanical units but not for Volts. Entered values can be in the range between 0.1000 and 12000 mV per mechanical unit.

9. Channel On/Off

Deactivate unused channels here. Deactivated channels will be skipped in the alternating measuring mode.

10. IEPE Supply

The constant current supply for the sensor can be switched off here. With IEPE supply switched off the display unit automatically becomes Volt.

11. Alarm

Here you may connect the alarm relay to the respective channel. If the measuring value exceeds the entered trip level, the relay will switch to alarm position.

12. Alarm Threshold

Enter here the trip level for the relay at the respective channel. The trip level can be between 0.100 and 9999. It is not relevant whether the display shows RMS or peak values, voltages or mechanical units.

13.1.3.3.3 Channel Overview

49 shows an overview of the channel settings for all connected devices which can be opened using the Channels tab.

Devices	Device Channels	Channels							
	Channel Number	Device	Device Name	Active	Lowpass	Highpass	Highpass enabled	20x Gain [dB]	Sensitivity
▶	1	090615	IEPE AMPLIFIER	<input checked="" type="checkbox"/>	30 kHz	undefined	<input checked="" type="checkbox"/>	2	01.252
	2	090615	IEPE AMPLIFIER	<input checked="" type="checkbox"/>	30 kHz	undefined	<input checked="" type="checkbox"/>	1	0.1000
	3	090615	IEPE AMPLIFIER	<input checked="" type="checkbox"/>	30 kHz	undefined	<input checked="" type="checkbox"/>	0	0.1000
	4	090615	IEPE AMPLIFIER	<input checked="" type="checkbox"/>	30 kHz	undefined	<input checked="" type="checkbox"/>	0	0.1000
	5	090615	IEPE AMPLIFIER	<input checked="" type="checkbox"/>	30 kHz	undefined	<input checked="" type="checkbox"/>	0	0.1000
	6	090615	IEPE AMPLIFIER	<input checked="" type="checkbox"/>	30 kHz	undefined	<input checked="" type="checkbox"/>	1	0.1000
	7	090615	IEPE AMPLIFIER	<input checked="" type="checkbox"/>	30 kHz	undefined	<input checked="" type="checkbox"/>	0	0.1000
	8	090615	IEPE AMPLIFIER	<input checked="" type="checkbox"/>	30 kHz	undefined	<input checked="" type="checkbox"/>	0	0.1000
*				<input type="checkbox"/>			<input type="checkbox"/>		

Figure 49: Channel overview

This table also allows changes of channel settings by clicking the respective cell. The following settings are available.

- Device Name: Switches to the device view of the respective M208A.
- Active: Switches a channel on or off.
- High pass: Switches the high pass filter on or off.
- Gain: Switches to the device channels menu.
- Sensitivity: Opens the transducer sensitivity menu. An error message is given if the measuring unit was Volts.
- Display Mode: Selects RMS or PEAK display.
- Display Unit: Switches to the device channels menu.
- Alarm: Connects the relay to the channel.
- Threshold: Opens the alarm level menu.
- IEPE: Switches the IEPE supply of the channel on or off.

The other values are only informative without operating function.

13.1.3.3.4 Other menus

Settings Menu

The settings menu shown in 50 can be opened from the menu File or by pressing the F2 key.

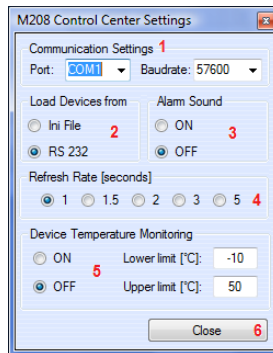


Figure 50: Settings menu

The following settings are possible:

1. Communication Settings

For changing the ComPort number and the baud rate of the used RS-232 interface.

2. Load Devices from

At program start the settings are loaded either from a *.ini file or via RS-232 from the M208A. Loading from a file assumes that no changes have been made at the M208A in the meantime. If you are not sure, reload the settings. This may take, however, up to 30 seconds.

3. Alarm Sound

A sound indicates when the alarm limit was exceeded.

4. Refresh Rate

This selection determines how often the measuring values are updated in the device channels view.

5. Device Temperature Monitoring

You may activate here temperature monitoring. It is also possible to enter the upper and lower threshold. If the temperature exceeds one of these limits, the displayed temperature in the Device menu will change its color.

6. Close

Closes the window after saving your settings.

Product Key Window

The window in 51 shows the installed product version. It can be opened from the File menu or by the F3 key.

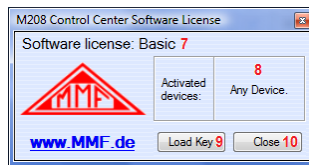


Figure 51: Product key window

7. Product version

The following versions are available:

- Basic: Free version featuring the tabs Devices, Device Channels and Channels.
- TEDS-Editor: Optional module for editing TEDS sensors.

8. Activated devices

Each license key is for one to eight M208A units which can be found in this field. A license is valid for a maximum of eight units. It is also possible to use these eight units with up to eight different computers simultaneously.

9. Load Key

Loads a license key and enables the respective functions.

10. Close

Closes the window after saving your settings.

13.1.3.3.5 Function Keys

The use of function keys F1 to F12 may facilitate the use of the program:

Program group:

- F1: Opens the help menu.
- F2: Opens the info window.
- F3: Opens the settings menu.
- F4: Opens the product key menu.

Function group:

- F5: Switches to the Devices tab and tries to load data from connected devices.
- F6: Switches to the Devices tab and updates the settings of the active device.
- F7: Erases all settings.
- F8: Searches for TEDS transducers.

Channel group:

- F9: Opens the Device Channels tab and switches all channels of the concerned M208A on or off according to the condition of channel 1.
- F10: Opens the Device Channels tab and sets the gain of all channels of the concerned M208A to the gain of channel 1.
- F11: Opens the Device Channels tab and switches all IEPE supplies of the concerned M208A on or off according to the condition of channel 1.
- F12: Opens the Device Channels tab and switches all alarms of the concerned M208A on or off according to the condition of channel 1.

13.1.3.3.6 Error Messages

The following error messages may occur:

- ComPort Error: Check the interface settings.
- Timeout Error: It took too long to receive an answer. Check the M208A.
- Invalid value: The entered value was out of limits.
- TEDS Error: Invalid value during a TEDS operation.
- Busy Error: One or more M208A units are not ready. Make sure that all units are in the measuring mode. All menus must be closed.
- General Error: Follow the instruction.

13.1.4. Communication via ASCII Commands

13.1.4.1. Introduction

All commands for control and readout are sent as ASCII strings via the serial interface. The M208A also responds with ASCII strings.

The following summary shows the available commands.

Attention should be paid to the following rules:

- Only capital letters and numbers are identified.
- All commands start with the symbol #, followed by a double-digit channel number between 01 and 64.
- The channel numbers 01 to 08 address the M208A which is directly connected to the PC via its interface "PC/MASTER". Channel numbers 02 to 16 address a second unit connected to the "SLAVE" interface of the first M208A and so on.
- All commands end with a carriage return character (CR / 13).
- Control commands are acknowledged by the M208A with OK or ERROR.
- Valid control commands are acknowledged by the M208A with a beep tone.
- Invalid commands are answered by two beep tones from the M208A.
- After receiving a read command the M208A sends an answer string followed by a carriage return character.
- Commands are rejected, if
 - the first symbol is not a #,
 - the second and third characters are not a channel number between 01 and 64,
 - the command includes invalid characters.
- No error message is sent if a command includes more characters than necessary. Redundant characters are ignored.
- No answer is sent if a channel number of a non-existing unit is addressed.
- Commands are not accepted if the menus GAIN, SETUP or SENSOR are opened at the addressed M208A or an upstream unit in the chain. In this case the M208A will answer any command with BUSY.

13.1.4.2. Control Commands

Gain

#ccGg c: channel number (01 to 64)
g: gain; 0 = 0 dB; 1 = 20 dB; 2 = 40 dB; 3 = 60 dB

Transducer sensitivity

#ccSsssss c: channel number (01 to 64)
s: sensitivity with decimal point, e.g.: "10.000" (mV/ms⁻²)
Notice: If "V" (volts) was selected as measuring unit, this command will be answered by an error message and the sensitivity remains at "0.1000".

Measurement on/off

#ccMm c: channel number (01 to 64)
m: 0 = measuring display for channel off; 1 = on

IEPE on/off

#ccIi c: channel number (01 to 64)
i: 0 = IEPE supply for channel off; 1 = on

Measuring unit

#ccUu c: channel number (01 to 64)
u: 0 = V; 1 = m/s²; 2 = N; 3 = Pa; 4 = kPa
Notice: By sending this command transducer sensitivity is reset to "0.1000".

High pass filter

#ccHh c: channel number (01 to 64)
h: 0 = high pass off; 1 = on

Stop at channel

#ccC c: channel number (01 to 64)
Measuring display permanently displays the selected channel.

Channel rotation

#ccR c: channel number (01 to 64) in the range of the desired M208A*
Activates channel rotation (to be stopped with #cC).
This command is valid for all channels of the addressed M208A.

Write TEDS EEPROM data

#ccE x...x c: channel number (01 to 64)
x: 32 bytes of data as ASCII formatted hex values divided by space characters, LSB on right side
Example: "1E 0A 12 E2 ..."

Write TEDS Application register

#ccA x...x c: channel number (01 to 64)
x: 8 bytes of data as ASCII formatted hex values divided by space characters, LSB on right side
Example: "1A 0A 12 E2 ..."
Attention: The application register can only be written once!

Display mode

#ccPp c: channel number (01 to 64) in the range of the desired M208A*
p: 0 = RMS; 1 = PEAK (for all channels)
This command is valid for all channels of the addressed M208A.

Baud rate

#ccBb c: channel number (01 to 64) in the range of the desired M208A*
b: 0 = 19200; 1 = 38400; 2 = 57600; 3 = 115200 Bits/s
This command is valid for all channels of the addressed M208A.
Notice: The baud rate must also be changed on the PC side.

Relay output

#ccOo c: channel number (01 to 64)
o: 0 = disabled; 1 = enabled

Relay trip value

#ccLlllll c: channel number (01 to 64)
l: trip value, 4 digits with decimal point, e.g.: "10.00"
Notice: A decimal point before the first digit is not allowed.

Key lock

#ccKk c: channel number (01 to 64) in the range of the desired M208A*
k: 0 = keypad enabled; 1 = disabled
Notice: At the M208A the keypad can only be unlocked by pressing the RESET button.

Beep tone

#ccZz c: channel number (01 to 64) in the range of the desired M208A*
z: 0 = beeper off; 1 = on

Overload limits

#ccJjj c: channel number (01 to 64) in the range of the desired M208A*
j: first digit = limit for sensor overload in Volts
second digit = limit for output overload in Volts
Permissible values are numbers from 3 to 9, representing 3 to 9 V and 0 for 10 V.

Instrument name

#ccFn...n c: channel number (01 to 64) in the range of the desired M208A*
n: Instrument name, max. 20 characters, shorter names are filled up with space characters, allowed are capital characters, numbers and space characters

- * Commands addressing the entire M208A but not a single channel must be sent with an channel number in the range of the unit to be addressed, e.g. cc = 01 for the first M208A, c = 09 for the second M208A, and so on.

13.1.4.3. Read commands

Read measuring value

#ccV c: channel number (01 to 64)
Answer: vvvvv uuuuu mmmm pp%
v: four-digit ASCII value with decimal point and space,
 "μ" replaced by "u", "°" replaced by "°"
u: measuring unit (5 characters, 1 space),
m: display mode RMS / PEAK (4 characters), space,
p: modulation in 5 % steps (2 characters) with % character.
Leading zeros are replaced by space characters.
At overload: OVERLOAD (without unit etc.)
If input shorted: IEPE SHORT (without unit
etc.)

If channel disabled: OFF (without unit etc.)
This command enables channel rotation.

Read channel parameters

#ccX c: channel number (01 to 64)
Answer: GgSssssuuuuuuMmIiUuHhOoLlllllFff
g/m/i/u/p/o/l: settings according to control commands
s: transducer sensitivity (6 characters)
u: unit of transducer sensitivity (7 characters)
f: index of plugged-in filter and integrator modules
1. digit = low pass:
 0 = undet.; 1 = 100 kHz; 2 = 50 kHz; 3 = 30 kHz; 4 = 10 kHz;
 5 = 5 kHz; 6 = 3 kHz; 7 = 1 kHz; 8 = 0,5 kHz; 9 = 0.3 kHz;
 A = 0.1 kHz
2. digit = high pass:
 0 = undet.; 1 = 1000 Hz; 2 = 500 Hz; 3 = 300 Hz; 4 = 100 Hz;
 5 = 50 Hz; 6 = 30 Hz; 7 = 10 Hz; 8 = 5 Hz; 9 = 3 Hz
Single integrator: 1. digit = S; 2. digit = I
Double integrator: 1. digit = D; 2. digit = I

Read instrument parameters

#ccY c: channel number (01 to 64) in the range of the desired M208A*
Answer: FffffffffffffffffBbKkPpCcZzJjTtt
f: instrument name (20 characters)
b: baud rate (0 = 19200; 1 = 38400; 2 = 57600, 3 = 115200)
k: key lock (0 = keypad enabled; 1 = disabled)
p: display mode (0 = RMS; 1 = PEAK)
c: channel rotation (0 = off; 1 to 8 for permanent display)
z: 0 = beeper off; 1 = on
j: first digit = limit for sensor overload in Volts
 second digit = limit for output overload in Volts
 numbers from 3 to 9 and 0 for 10 V
t: inside temperature in °C, sign and two digits

Read serial number

#ccN c: channel number (01 to 64) in the range of the desired M208A*
Answer: nnnnnn (6-digit serial number as on the rear panel)

Read TEDS raw data

#ccT c: channel number (01 to 64)
Answer: TEDS raw data of selected channel, LSB right
 ASCII formatted hex bytes divided by space character (e.g. "0A 32 90 14..."),
 ROMxyyyyyyz (ROM content; x: CRC; y: serial number; z: family code)
 APPxyyyyyyy (x: status byte; y: application register content, 8 bytes)
 EEPxxx...xxx (EEPROM content, 32 bytes)

Read TEDS data

#ccW c: channel number (01 to 64)
Answer: TEDS data of selected channel
MmmmmmmTtttttLIVvvSssssssDdNnnnnUuuuuuuuuuuuuuu
m: manufacturer code
t: transducer model number (5 digits)
l: version letter
v: version number (2 digits)
s: serial number (8 digits)
d: measuring direction (x/y/z)
n: measuring ID (4 digits)
u: user text (up to 15 digits)

Read calibration data

#ccD c: channel number (01 to 64) in the range of the desired M208A*
Answer: gggg gggg gggg ... gggg (with carriage return)
 zzzzz zzzzz zzzzz ... zzzzz (with carriage return)
 ffff ffff ffff ... ffff
g: 32 signed correction values with decimal point in percent
 for the amplifiers, e.g. "+1.2", four values per channel for
 the gain ranges 0, 20, 40 and 60 dB, starting with
 channel 1 (0 dB), ending with channel 8 (60 dB)
z: 8 zero correction values for the measuring display,
 5 digits, e.g. "02048", starting at channel 1
f: 8 full-scale correction values for the measuring display,
 5 digits, e.g. "32512", starting at channel 1

- * Commands addressing the entire M208A but not a single channel must be sent with an channel number in the range of the unit to be addressed, e.g. cc = 01 for the first M208A, c = 09 for the second M208A, and so on.

13.2. Ethernet Interface

13.2.1. Introduction

The Ethernet interface of the M208A allows integration into existing computer networks in a simple way. The M208A includes a web server providing an HTML page via a TCP/IP connection. By this means a remote user can read the measuring results in a web browser and change the most important settings of the M208A.

13.2.2. TCP/IP Settings

Before a network connection can be established, some basic settings have to be made. Open the menu “6/6: Div. settings” / “3/9: Ethernet”. A message is shown that the serial interface will be disabled when the Ethernet interface is activated.

A password menu follows. The password protects the M208A against unauthorized manipulations by other network clients. It may consist of capital letters, numbers and space characters. Maximum length is eight characters. Use the keys ▲ ▼ ◀ ▶ to enter the password. Press ESC to leave the menu without changes.

Now enter the IP address which will identify the M208A among other network partners. The IP address is entered in dot-decimal notation, i.e. four numbers between 0 and 255, divided by dots. Any address can be entered. However, in private networks only addresses from the range 192.168.0.0 to 192.168.255.255 are allowed. The address menu starts with the last number. Use the keys ▲ ▼ to change a digit and ◀ ▶ to change between digits. Press OK before entering the next number.

When selecting an IP address, please notice that:

- the address only must exist only once in the network,
- the third number may be preset by a network router (178 in the example below).

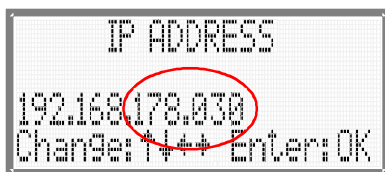


Figure 52: Entering an IP address

In the subsequent menu for the subnet mask the default value of 255.255.255.000 can be usually kept, i.e. press OK twice.

A gateway address must only be specified if the communication partner is not in the same subnet. The menu can usually be skipped.

You may leave the menu at any point by pressing ESC. All changes which you have entered already by the OK key will be stored. Any other settings will be unchanged.

For identification in the network also the MAC address is needed. It is the serial number of the M208A which cannot be edited by the user. The serial number or MAC address is displayed after pressing the key ◀ in measuring mode.

13.2.3. Establishing an Ethernet Connection

After connecting the M208A to the network via a standard RJ45 network cable and entering the TCP/IP settings, you may call it from a web browser of a PC in the same network.

Enter the IP address of the M208A in the browser's address line, for example <http://192.168.178.30>

Important: Leading zeros are stripped, e.g. “30” instead of “030”.

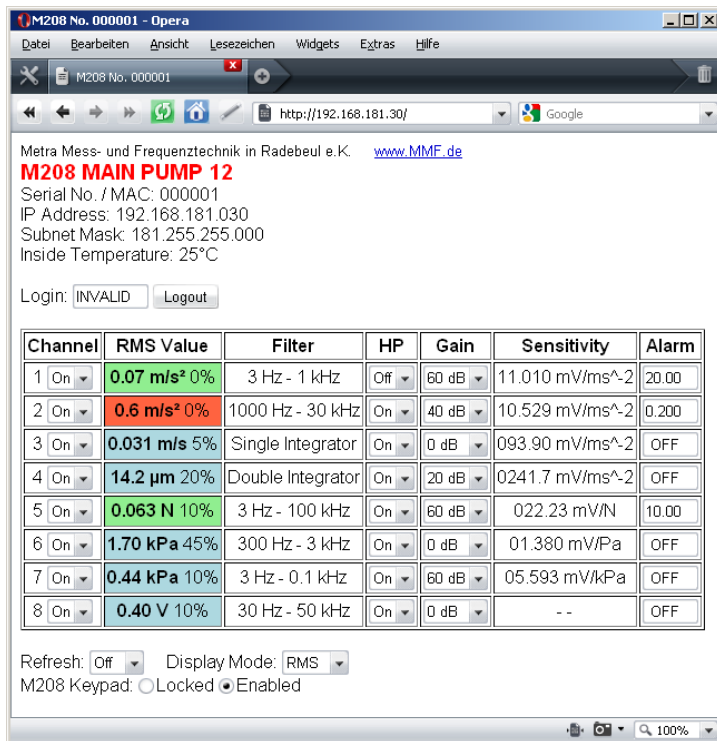


Figure 53: HTML page sent from the M208A

The M208A should answer now with an HTML page as shown in 53. The headline consists of the type (M208A) and the individually entered instrument name (section 12.5 on page 31).

Below, the TCP/IP settings and the inside temperature are displayed.

The table provides the following information about each channel:

- Measuring value with unit and modulation in steps of 5 % of the full scale value, alternatively “OVERL” for overload an “OFF” if channel disabled
- Filter frequencies and high pass mode (on/off)
- Gains
- Transducer sensitivities
- Alarm relay trip values

The measuring values are colored:

- White: channel off
- Blue: alarm relay disabled for this channel
- Green: alarm relay activated but not tripped
- Red: alarm relay activated and tripped

To change settings of the M208A from the HTML page a password is required. This is the password you have entered in the Ethernet menu of the M208A (compare section 13.2.2 on page 52). Type in the password in the input field after “Login”. Please note that only capital letters, numbers and space characters are accepted. Press the Enter key while the cursor is in the input field. If the password was accepted by the M208A the text in the “Login” field will change to “OK”. Otherwise “INVALID” will be displayed.

When the “Login” field shows “OK” the following settings can be changed from the HTML page:

- Disabling / enabling measurement for selected channels by pull-down menu
- Switching the high pass filters on/off by pull-down menu
- Gain (0 / 20 / 40 / 60 dB) by pull-down menu
- Alarm relay trip values by entering a four-digit number with decimal point
- RMS or peak selection by pull-down menu (selection displayed in table head)
- Disabling / enabling the keypad by radio button

The time interval selected in the “Refresh” pull-down menu is the time after which the browser automatically reloads the page. Please note that the entered refresh interval will not become effective until another parameter is changed in the HTML page.

All data shown in the table was actually read from the instrument. All connected users will see the same data after refreshing the page.

The HTML page was designed in a simple manner. For more complex tasks like saving results or graphical output, the use of HTML parsing techniques is recommended. Particular data can be isolated from the HTML content by filtering certain character strings. The static structure of the HTML page simplifies the parsing process.

Notice: Only one command at a time can be sent from the HTML page to the M208A. Wait until the HTML page has reloaded with the changed parameter, before entering further changes.

Notice: The embedded server may become overloaded temporarily due to its limited capacity, particularly by simultaneous requests from multiple clients.

Notice: The serial interface is disabled when using the Ethernet interface.

14. Reset

If the M208A should not react on key or interface commands or show any other abnormal behavior, you may restart the firmware by pressing the RESET key. Switching off the power supply has the same effect.

The instrument can be reset to the default settings as described in section 12.6 on page 32.

15. Calibration

15.1. General

This section is intended only for users with sufficient experience in the field of the measurement of low AC signals and with precise measuring equipment of traceable accuracy.

We recommend a factory re-calibration at Metra after two years when the M208A was used under normal environmental conditions.

The M208A can be calibrated without opening the case. There are no adjustment points inside.

Click the “MENU” key to open the menu “6/6 Div. settings” and the submenu “5/9: Factory setup”. This menu is password protected to avoid unwanted alteration. Enter the following password: “1410”.

After opening the calibration menu the IEPE constant current sources and the high pass filters are automatically switched off.

In some cases it may be advantageous to reset all calibration values to 0.0 % before calibration. This can be done by holding the MENU key while pushing the RESET key at the rear panel. Erasing the calibration values must be confirmed by OK.

⇒ Important: Please perform the calibration steps always in the order of the following chapters.

15.1.1. Gain Calibration

Open the submenu „2/5: Gain calibration“.

Gain calibration is performed by feeding a sine-wave generator signal into all eight inputs simultaneously. Use “T” couplers and short BNC cables to interconnect the inputs. The generator frequency shall be 80 Hz and the RMS value 5.000, 50.00, 500.0 or 5000 mV, depending on the gain range to be calibrated. In addition to the generator, a calibrated RMS voltmeter should be connected to the inputs.

The amplifier output voltage is measured at the connector “SWITCHED OUTPUT” with a second calibrated RMS voltmeter. The signal quality at the outputs should also be checked by an oscilloscope.

Select the channel to be calibrated (“Channel No.:", 1 to 8) and the gain range (“Gain range”, 0/20/40/60 dB) by the ▲▼ keys. Feed in the generator signal according to the display of the M208A, for example 50.00 mV in the gain range 40 dB.

The M208A will display the previously entered calibration value in percent, for example “-0.3%”. Change this value by the ▲▼ keys in steps of 0.1 % until the output voltage is exactly 5000 mV (RMS). Limits for calibration are ± 2 %. Press OK to save your adjustment and to switch to the next channel or gain range.

15.2. Display Calibration

After finishing gain calibration you may proceed with the calibration of the display.

Open the menu “3/5: Display calibrat.”.

Start with the calibration of the zero points for channels 1 to 8. Terminate all inputs with BNC termination resistors of $<100\ \Omega$. Adjust for each channel the display zero point by the $\blacktriangle\blacktriangledown$ keys. Confirm by pressing OK.

This is followed by the calibration of the full-scale values for the display. Feed a generator signal of 5000 mV (RMS) at 80 Hz into inputs 1 to 8 simultaneously. Calibrate the display for the eight channels to exactly “5.00 V” by the $\blacktriangle\blacktriangledown$ keys. Press OK to confirm.

16. Version and Serial Number

The version number of your M208A will be displayed after pressing the key \blacktriangleleft in measuring mode. The format of the version number is xxx.yyy with the hardware version xxx and the firmware version yyy. The line beneath shows the firmware upload date and the serial / MAC number which corresponds to the serial number label on the rear panel.

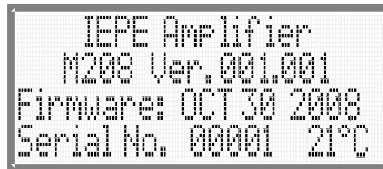


Figure 54: Version, serial number and inside temperature

In the lower right corner the inside temperature of the M208A is displayed.

17. Frequently Asked Questions

What happens to my settings after a power cut?

The settings are restored from the non-volatile memory and the M208A resumes measurement.

Why can't I enter a transducer sensitivity?

You must first select a mechanical measuring unit first (section 10.4 on page 20).

I have plugged in an integrator module. Why doesn't change the display unit?

Perform filter detection (section Fehler: Verweis nicht gefunden on page Fehler: Verweis nicht gefunden).

I have connected some TEDS transducers. Why aren't they detected by the M208A?

The unit must be switched on when sensors are connected. Connect the sensors one by one and wait until each sensor is detected (section 10.2.4 on page 17).

Why doesn't the sensitivity menu open automatically when I connect a sensor?

Make sure that the IEPE supply is on (section 12.4 on page 31).
Select the mechanical measuring unit of the sensor (section 10.4 on page 20).

Why doesn't an entry in the menu "Measuring unit" change the displayed unit?	The respective channel may be equipped with an integrator module. Integration is only possible for acceleration input.
Why doesn't the M208A react to commands from the serial interface?	Have you activated the serial interface in the menu "Diverse Settings" / "Serial Interf."? Have you selected the same baud rates on both sides (section 12.2 on page 30)? Make sure that the PC software is set to the correct COM port.
Why can't an Ethernet connection be established?	Have you activated the Ethernet interface in the menu "Diverse Settings" / "Ethernet"? Are the TCP/IP settings correct (section 13.2.2 on page 52)?
Why are there interferences in the output signal?	The reason can be unterminated inputs of other channels (see advice on page 31).
Why is a measuring channel overloaded even though there is no input signal?	Unterminated inputs, even of other channels, can be susceptible to EMI. Deactivate unused channels (see advice on page 31).
Why aren't connected IEPE sensors automatically recognized?	See advice on page 17.
Why does the instrument display "Keypad locked" when I press any of the keys?	The keypad was locked via one of the interfaces. Unlock the keypad by the respective interface command or press the RESET button.
Why is there an overload message even though the output is below 10 V peak?	Check the overload limits (section 12.7 on page 32).

18. Technical Data

Inputs	8 voltage inputs; single-ended; $R_i = 4\text{ M}\Omega$ AC coupled; IEPE compatible; BNC sockets $\pm 10\text{ V}$ without clipping at 0 dB gain $\pm 25\text{ V}$ peak input voltage
IEPE sensor supply	3.8 to 5.6 mA constant current; switchable compliance voltage $> 24\text{ V}$ short circuit and cable break indication
Suitable sensors	IEPE compatible accelerometers, force transducers, pressure transducers and measuring microphones Sensitivity range: 0.1000 to 12000 mV/mechanical unit
Gain	0 / 20 / 40 / 60 dB and incremental
Gain accuracy	$< 0.3\%$ of nominal value at $T = 15$ to $25\text{ }^\circ\text{C}$; $U_a = 1$ to 5 V (RMS); $f = 80\text{ Hz}$; high pass off; low pass 100 kHz
Noise (wide band)	$< 10\text{ mV}_{\text{RMS}}$ (0.1 Hz - 30 kHz)
Noise densities	1 Hz: $600\text{ }\mu\text{V}/\sqrt{\text{Hz}}$ 10 Hz: $150\text{ }\mu\text{V}/\sqrt{\text{Hz}}$ 100 Hz: $60\text{ }\mu\text{V}/\sqrt{\text{Hz}}$ 1000 Hz: $60\text{ }\mu\text{V}/\sqrt{\text{Hz}}$
Cross-talk attenuation	$> 80\text{ dB}$
Frequency range	0.1 .. 100 000 Hz (-3 dB); max. $\pm 3\text{ V}$ output at 60 dB and $> 50\text{ kHz}$
High pass filters	Plug-in modules: 3 / 5 / 10 / 30 / 50 / 100 / 300 / 500 / 1000 Hz frequency tolerance $\pm 10\%$; 2 nd order Butterworth filter
Low pass filters	Plug-in modules: 0.1 / 0.3 / 0.5 / 1 / 3 / 5 / 10 / 30 / 50 / 100 kHz frequency tolerance $\pm 10\%$; 4 th order Butterworth filter
Integrators	Single integrator module FBV; double integrator module FBD
Outputs	8 buffered channel outputs; $\pm 10\text{ V}$; 100 Ω ; BNC; Sub-D 1 buffered shared output; $\pm 10\text{ V}$; 100 Ω ; BNC; Sub-D output offset voltage: $< 3\text{ mV}$
Measuring display	4 digits and decimal point true RMS or peak detection
Display range	10^{-5} to 10^5 mech. units (depending on transducer sensitivity)
Display error	$< 2\%$ of nominal at $T = 15$ to $25\text{ }^\circ\text{C}$; $U_a = 1$ to 5 V (RMS); $f = 80\text{ Hz}$; high pass off; low pass 100 kHz
Overload indication	at sensor input, before filtering and at output LEDs, display and beeper at 90 % of full-scale value sensor overload limit adjustable from ± 3 to $\pm 10\text{ V}$ output overload limit adjustable from ± 3 to $\pm 10\text{ V}$

Warm-up time	5 min
Serial interfaces	RS-232 Master; RS-232 Slave; 19200 .. 115200 Bits/s 7 data bits; 1 stop bit; even parity; no flow control
Number of slave units	7
Ethernet interface	10 Base-T; RJ45 socket
Relay output	1 relay; trip value selectable for each channel change-over contact; rating 1 A / 30 V
Power supply	10 to 28 V DC; < 1.5 A; DIN 45323 power connector
Operating temperature range	-10 to 50 °C
Dimensions	483 mm (19") x 44 mm (1 HU) x 124 mm
Weight	1.7 kg

Limited Warranty

Metra warrants for a period of
24 months
that its products will be free from defects in material or workmanship
and shall conform to the specifications current at the time of shipment.

The warranty period starts with the date of invoice.
The customer must provide the dated bill of sale as evidence.
The warranty period ends after 24 months.

Repairs do not extend the warranty period.
This limited warranty covers only defects which arise as a result
of normal use according to the instruction manual.

Metra's responsibility under this warranty does not apply to any
improper or inadequate maintenance or modification
and operation outside the product's specifications.

Shipment to Metra will be paid by the customer.
The repaired or replaced product will be sent back at Metra's expense.

Declaration of Conformity

According to EMC Directive 2014/30/EC and
UK Electromagnetic Compatibility Regulations 2016

Product: 8 Channel IEPE Conditioner
Type: M208A (from Ser. no. 160000)

It is hereby certified that the above mentioned product complies
with the demands pursuant to the following standards:

DIN / BS EN 61326-1: 2013
DIN / BS EN 61010-1: 2011
DIN 45669-1: 2010

The producer is responsible for this declaration
Metra Mess- und Frequenztechnik in Radebeul e.K.

Meißner Str. 58, D-01445 Radebeul

declared by



Michael Weber
Radebeul, November 21, 2022