

# DYNAMate – User Manual

## Specifications

### Operation Limits

Parameter	Value	Units
Maximum Voltage		
Trigger	5000	Volts
Sensor Input	150	
DC Input	36	
USB	10	
Temperature Range	-10 to +70	°C

### Power Requirements

Parameter	Value	Units
DC Input Voltage	9-36	Volts
Current Consumption	450	mA

### Data Acquisition

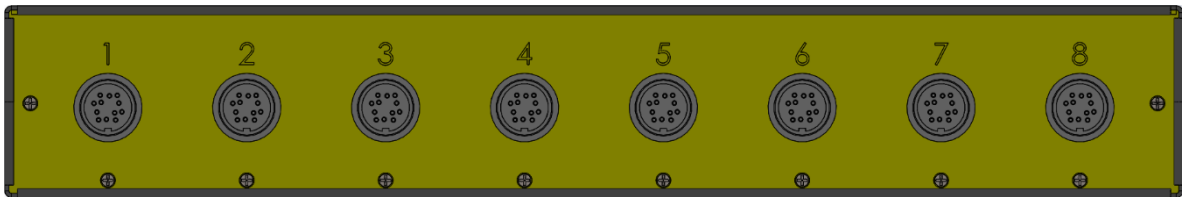
Parameter	Value	Units
Resolution	16	bit
Sample Rate	4000 downsampled to 1000	Hz
Conversion Time	4	μs
Analog Bandwidth	250	Hz
CMRR, DC to 60 Hz	100	dB
Gain Error	115	ppm
SNR	75	dB
Crosstalk	-65	dB

### Filters and Amplification

Parameter	Value	Units
Filter Bank – low-pass	32, 64, 128	Hz
Roll-off	80	dB/dec
High-pass	0.01	Hz
Roll-off	40	dB/dec
Input Amplifier		
Gain	x5, x50	
Output Amplifier		
Gain	x1, x10, x100, x1000	
Calibrated Sensitivity Scales	100, 10, 1, 0.1, 0.01	mm/s

# Inputs and Operation

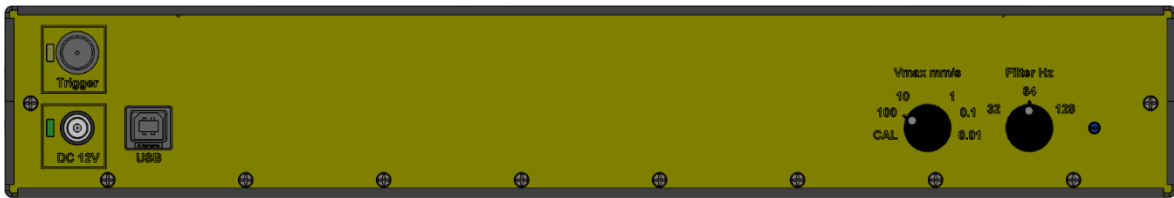
## Back Panel



The back panel contains the input ports for attaching the provided sensors. The ports are numbered form 1-8 and correspond to the panels in the data logging software. All sensor ports, sensors and corresponding cables use polarized connectors to ensure proper mating. Every port has 20kOhm input resistance and has the following pinout:

	Pin	Signal
	A	Z-
	B	X+
	C	X-
	D	Y+
	E	Y-
	F	N\C
	G	CAL+
	H	Cal-
	J	N\C
	K	Z+
	L	N\C
	M	N\C

## Front Panel



The front panel contains the data, power supply and control interfaces of the data acquisition unit. The two knobs on the right side of the panel control the currently selected amplification and filter cutoff. The amplification controls the maximum recordable velocity before clipping occurs, and it supports 100, 10, 1, 0.1 and 0.01 mm/s with the provided sensors. The CAL setting of the amplification knob enables the internal calibration pulse generator which is used to verify sensor function. Calibration constants will vary if sensors different from the provided are used.

On the left side of the panel are the data and power interface ports. Computer connection is achieved using the USB 2.0 port, which also powers the internal ADC. Amplifiers and filters are powered by the DC 12V plug (5.5mm/2.55mm barrel connector). The nominal power supply voltage is 12V, however the system can support a supply voltage between 9 and 36V. A red/green LED is provided beside the power supply port that monitors the polarity of the provided power supply, it will illuminate green when the power supply meets requirements, and red otherwise.

The trigger input is a 75ohm coaxial BNC connector, and should be used with matching coaxial cable. It is internally isolated from the rest of the circuitry for up to 5kV. While external power is connected to the unit, and the trigger input is not connected to an external trigger, the center pin of the coax is kept at 5V DC through an internal pull up resistor, while the bayonet is at 0V. Triggering condition occurs when the two pins are shorted and 0V appears on the center pin of the connector (with respect to the connector sleeve).

### Fuse Location

In case of a short or overcurrent through the power supply unit, the internal protective fuse will blow to preserve the electronics. The fuse is MINI-ATO 2A rated auto fuse and is located behind the power supply port. To replace the fuse the top lid should be removed by removing the 8 screws (4 on each side of the lid) and the fuse replaced. The following picture shows the location of the fuse:



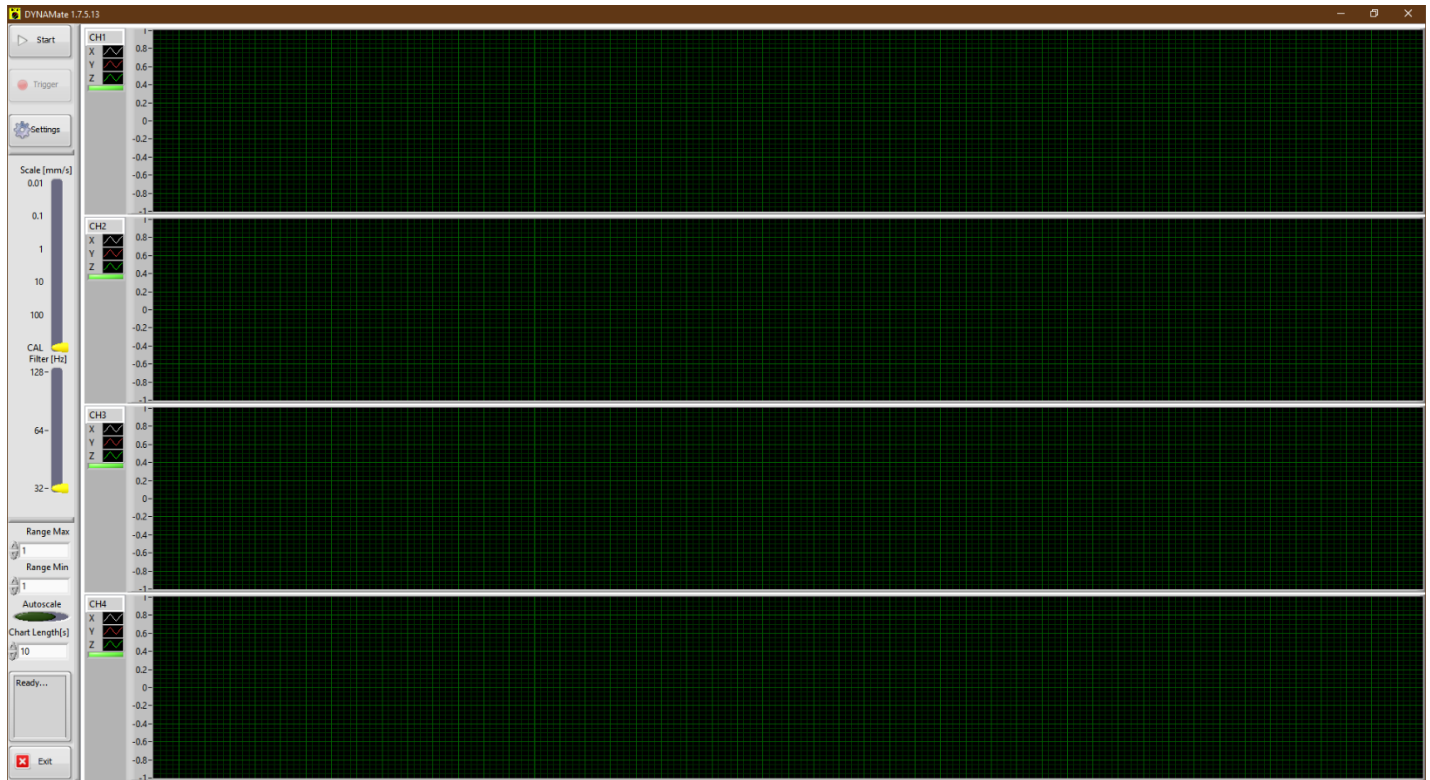
### Sensor installation

The kit contains two types of sensor platforms. A short option that fits between the legs of the sensor, and a long option that is larger than the footprint of the sensor. Selection of which platform is be used is depended on the intended application, and available mounting surface. To properly install the sensor unit, the mounting surface (concrete, metal or wood) should be cleaned of all debris and grease. Using the provided leveling gauge, the platform should then be placed on the surface, and using shims it must be leveled. Using fast setting epoxy (or other suitable adhesive) the platform and shims should then be secured in place, by thoroughly covering the bottom of the platform with adhesive and then proper time should be given for the adhesive to set. Once the platform is secured the sensor is mounted on top using the provided brackets, screws and foam insulators.



# User Interface

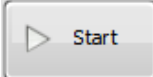


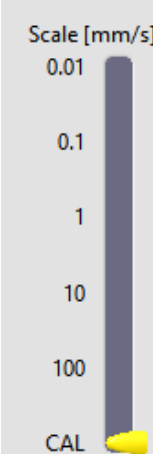
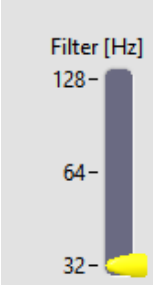
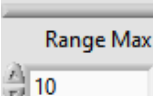
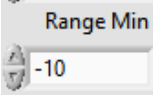
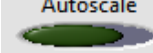
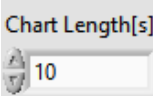
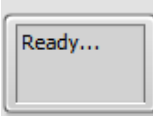

## Main UI Window



The user interface consists of a control panel situated on the left-hand side of the screen and signal monitoring panels for active channels in the middle of the screen.

	<p>The Channel legend present for each active channel displays: configured Channel Name(top), Component legend(middle) and clipping indicator(bottom). Active channels are configured using the setting menu. The clipping indicator will turn red for signal sections that exceed the selected amplification scale.</p>
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	<p>By default, the chart displays will fill out right to left with new samples entering from the right. Under the right click context menu, auto scales can be toggled individually for each channel, and for either axis: amplitude or time. The charts can be cleared and annotated using the context menu as well. It also allows the data of that specific chart to be copied to the clipboard in ascii format.</p>
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          	<p>Start/Stop button</p> <p>Force Trigger</p> <p>Settings button</p> <p>Currently selected amplification scale in mm/s</p> <p>Currently selected filter</p> <p>Max amplitude</p> <p>Min amplitude</p> <p>Toggle Auto scale For all charts</p> <p>Chart duration</p> <p>Status Display</p> <p>Close the application</p>	<p>All controls are disabled until the Start button is pressed. Pressing the button will begin data collection and visualization but will not start logging until a trigger condition is met. Once the system is running the Start button will toggle to the Stop button, which terminates the current acquisition task and disables other controls.</p> <p>The trigger button forces a trigger condition regardless of the current trigger mode. Pressing the button will begin data logging based on the last setting configured in the settings menu.</p> <p>Logging configuration can be modified through the Settings window (see next Section)</p> <p>The current hardware setup is displayed in the two bar controls, which are read-only, as those settings can only be changed using the knobs provided on the DAQ unit.</p> <p>The displayed chart amplitude will scale according to the currently selected amplification, and it will always be displayed in mm/s.</p> <p>Any change to the max/min amplitude controls will affect all chart displays at the same time and disable autoscaling for all charts. If it is required, scales can be set individually for each chart by clicking the number displayed on the corresponding axis and entering the required values. Autoscaling can be either set individually for each chart by right clicking the chart or the amplitude scale, and then selecting the auto scale option, or at the same time for all charts by clicking the autoscale control.</p> <p>The length of data displayed at a time can be adjusted for all charts at the same time by using the chart Length control.</p> <p>The status display will show the current state of the unit, as well as potential error messages relevant to the operation of the unit.</p> <p>The application can be closed by clicking the exit button, which will be terminating the current acquisition session, and close any open logging files.</p>
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## Configuration Window

The image shows three side-by-side screenshots of the 'Configure' window, each with a different tab selected.

- Left Screenshot (Logging tab):** Shows logging configuration options. Under 'Logging', 'Trigger Based on Channel' is selected. 'Sample Rate [Hz]' is set to 1000. 'Record Length [s]' is set to 10. 'Trigger Channel' is set to CH1X. 'Trigger Threshold [mm/s]' is set to 0. 'Pre-Trigger Buffer[s]' is set to 0. 'Beep When Complete' is unchecked. 'Log File Path' is D:\Documents\LabVIEW Data\Logged Data.tdms.
- Middle Screenshot (Channels tab):** Shows a table of channels. The 'Sensor response extension to 1Hz' checkbox is checked.
- Right Screenshot (Description tab):** Shows fields for 'Title' and 'Description'.

Channel	Name	Sensor ID	Comps	Description
1	CH1	NA	XYZ	
2	CH2	NA	XYZ	
3	CH3	NA	XYZ	
4	CH4	NA	XYZ	
5	CH5	NA	XYZ	
6	CH6	NA	XYZ	
7	CH7	NA	XYZ	
8	CH8	NA	XYZ	

### Logging Configuration

This page allows the configuration of acquisition, triggering and logging parameters.

Configurable parameters are: Sample Rate (max 1000 Hz), Record length, Pre-trigger buffer size. The pre-trigger buffer will store up to the specified number of seconds of data and store it in the output file at offset time stamp, i.e. for a 10sec record with 2s pre-trigger the final file will begin at time -2s and be 12s long (end at 10s).

The pane also allows the user to set logging parameters data logging path and file name, triggering condition. All logged data is saved in TDMS format. It can be opened in Microsoft Excel, using the provided plugin or post-processed using DynaMateProcess.

Four different triggering options are supported:

1. Always Log – As soon as the start button is pressed all data will be recorded to the specified file
2. External Trigger – Logging will start based on the external trigger
3. Based on channel - By specifying a channel number and a threshold, logging will begin as soon as the given channel crosses the specified threshold. Channels available for triggering must be selected as active channels in the Channels pane
4. Forced Trigger – When in either External Trigger or Channel trigger, pressing the Trigger button on the Main UI will start the logging process, bypassing any trigger requirements.

Each time a trigger condition occurs, a new filename is created using the provided filename, by concatenating the filename with the timestamp of file creation. Each file will contain a maximum number of samples determined by the specified Record length. If the Beep when complete switch is set, then at the end of each record DynaMate will play the system notification sound to alert the operator to the end of recording event.

### Channel Configuration

The channel configuration pane allows the user to select which channels are considered active. This is done by selecting multiple lines in the provided table, by either holding Shift or Ctrl while clicking on the lines. To edit channel description, name, etc. use double click in the appropriate cell. Sensor IDs(number displayed on the actual sensor) should be specified correctly for response expansion to work accurately.

If the sensor response extension is enabled, then DynaMate will visualize and log data that has undergone digital response expansion to 1Hz, if it is not enabled the sensor response starts from 4.5Hz.