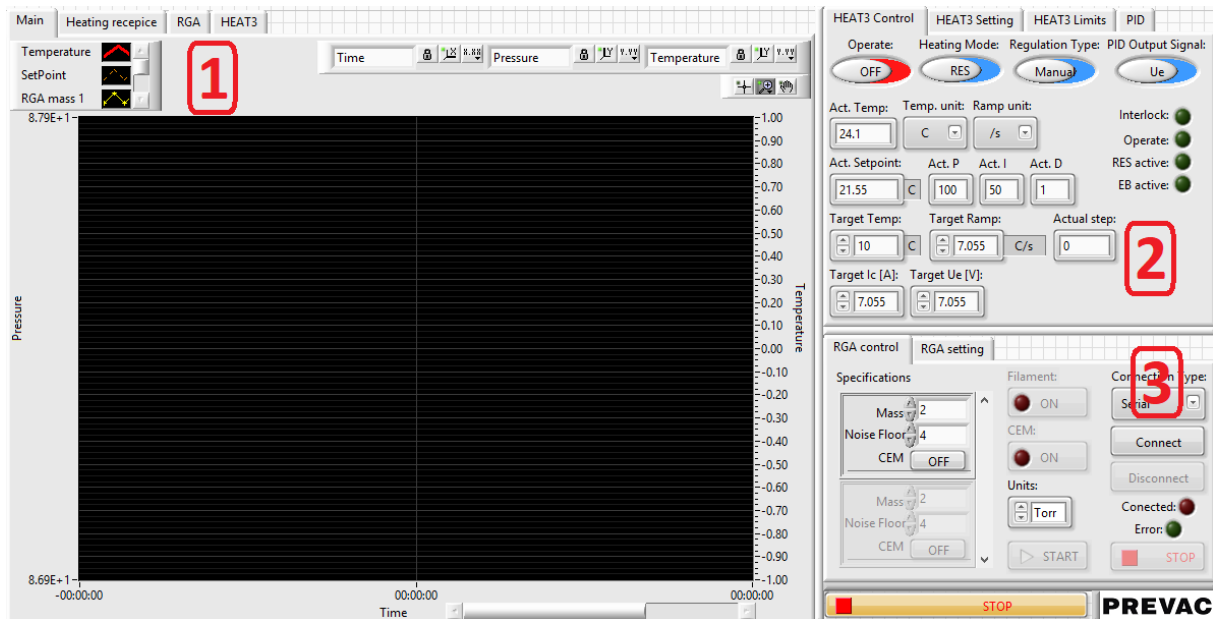


1. "TDS – Thermal Desorption Spectroscopy" application

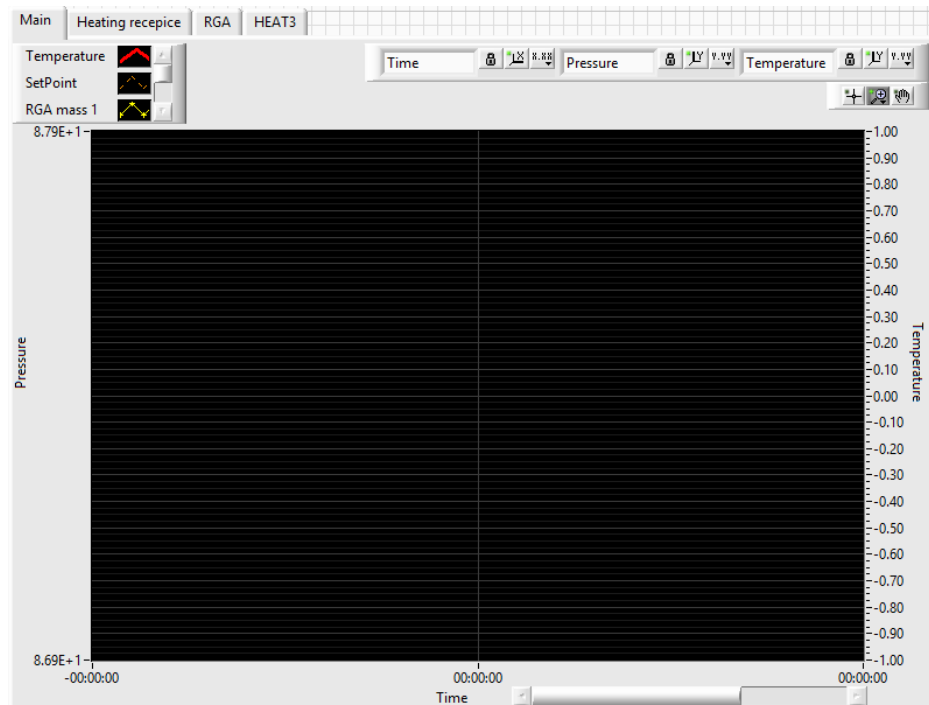
The application is used to control the HEAT3 and RGA power supplies for thermal desorption spectroscopy. The application enables preparing a recipe for heating and acquisition of measurement data.



The application consists of three independent windows:

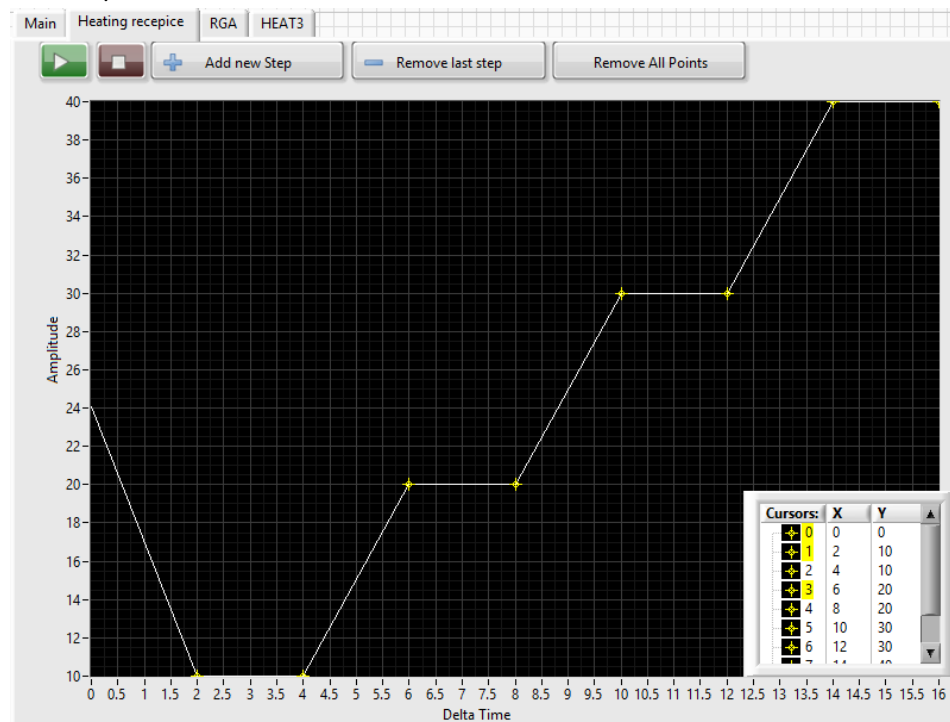
1. The data preview and recipe window consists of 4 tabs:

- a. Main - this tab contains a graph showing historical temperature data from the HEAT3 and measurement data from RGA



The order of measurement data from the RGA depends on the configuration introduced in the "Specifications" table ("RGA control" tab, see point 3.a), for example the first mass configured in this table in the graph takes the name "RGA mass 1".

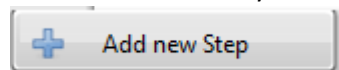
- b. Heating recepcie - this window enables planning a heating recipe and activate/deactivate it.



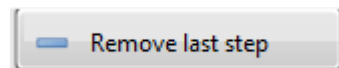
The graph allows you to manually move points, using the press and move method. You can also add new points using a double-click on the graph, the new point will appear in the place indicated by the cursor. A zero recipe step always indicates the current temperature read from the HEAT3.



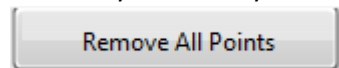
- Keys used to start/stop the recipe



- a key for adding two consecutive points (creates a next step) the first one raises the temperature by 10 degrees for the set time and the other maintains the new temperature for the set time.



- a key removing the last two points from the recipe, it allows you to easily remove the next steps of the recipe.

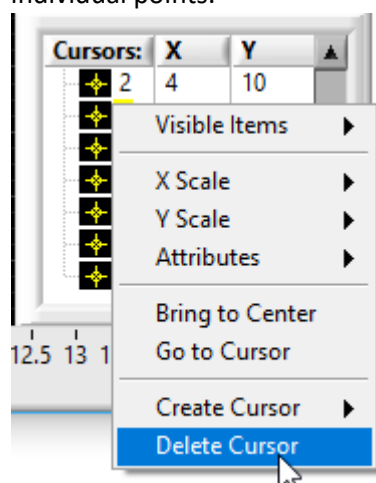


- a button removing all points from the recipe, leaving the zero point.

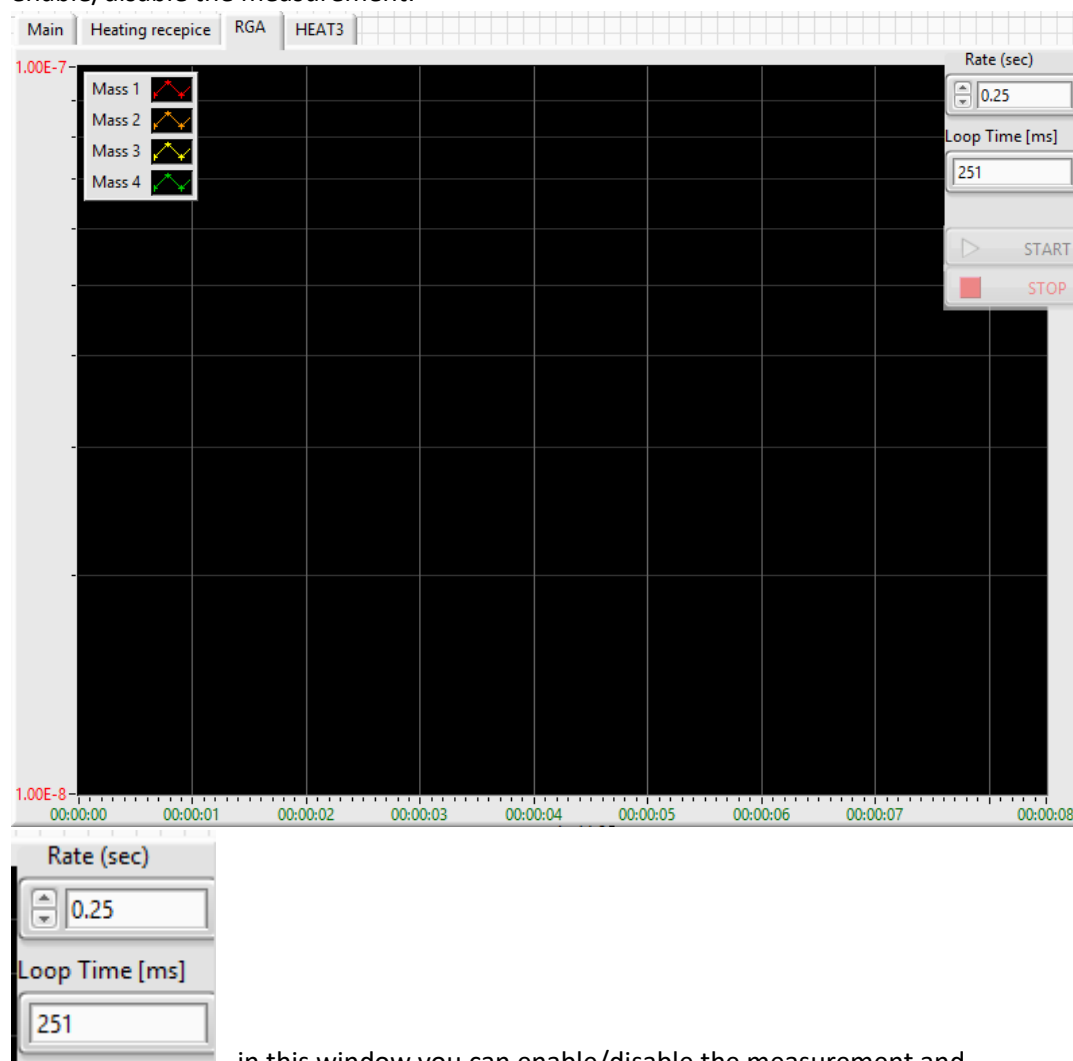
Cursors:			X	Y
0	0	0	0	0
1	2	10	2	10
2	4	10	4	10
3	6	20	6	20
4	8	20	8	20
5	10	30	10	30
6	12	30	12	30
7	14	40	14	40

- recipe window - in this window you can precisely edit individual recipe points, column X is responsible for time in min, column Y

for the set temperature, recipe time is relative. Here you can also add/remove individual points.

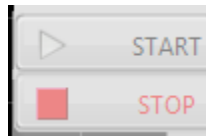


- c. RGA - In this tab, you can view measurement data from the RGA, you can also enable/disable the measurement.



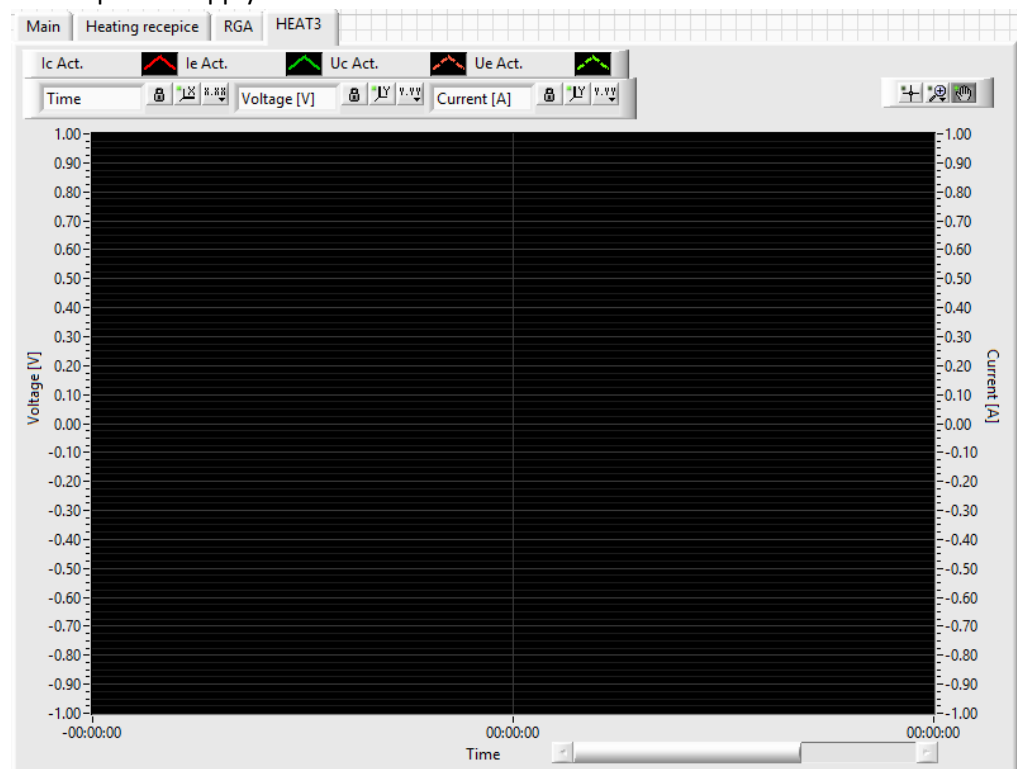
- in this window you can enable/disable the measurement and specify reading frequency, the value displayed in the loop time window informs about the real period of data reading from the RGA when the measurement is

active, it is recommended to set the Rate value so that the Loop Time value is equal to it after activating the measurement, when the value of the actual reading period is greater than the Rate value it is recommended to stop the measurement and increase the Rate value.



The start/stop keys turn on and off the measurement. When the measurement is being started, the measurement is initialised, which may take several seconds. Before starting the measurement

- d. HEAT3 - in this window we can see the graph of current parameters sent by the HEAT3 power supply.



2. Heat3 power supply operation window - in this part of the application it is possible to control the HEAT3 power supply. This window consists of 4 tabs:
 - a. Heat3 Control - in this window you can see the basic parameters of the power supply - basic control of the device is also possible in this window,

HEAT3 Control HEAT3 Setting HEAT3 Limits PID

Operate: Heating Mode: Regulation Type: PID Output Signal:

OFF RES Manual Ue

Act. Temp: Temp. unit: Ramp unit:

24.1 C /s

Act. Setpoint: Act. P Act. I Act. D

21.55 C 100 50 1

Target Temp: Target Ramp: Actual step:

10 C 7.055 C/s 0

Target Ic [A]: Target Ue [V]:

7.055 7.055

Interlock: ☒ Operate: ☒ RES active: ☒ EB active: ☒

Operate:

OFF

- turn on/off Operate

Heating Mode:

RES

- change of RES/EB heating mode

Regulation Type:

Manual

- change of adjustment mode,

Manual - control of current parameters (no feedback loop)

Auto - control in the temperature control loop.

PID Output Signal:

Ue

- PID controller output signal (Ue or Ic) in the Auto mode.

In this window you can also change the temperature unit and the time base for speed units

- b. Heat3 Settings - this window is responsible for configuring the connection with the device and enables viewing current communication errors

HEAT3 Control | **HEAT3 Setting** | HEAT3 Limits | PID

address: 10.10.84.6

Default Ramp: 60 C/s

error out

status: code: 0

source:

loop time: 499

Default Ramp:

60 C/s

– value of the temperature change frame, if the resultant value from the recipe is less than 0.1C/s

loop time

500

- the value of this parameter should oscillate around 500ms, too high value indicates communication problems with the HEAT3.

- c. Heat3 limits - in this window you can set current and voltage limits for both heating modes, this window also displays current voltage and current values

HEAT3 Control | HEAT3 Setting | **HEAT3 Limits** | PID

RES:

Ic limit [A]: 0
Ic Act.: 0

Uc limit [V]: 0
Uc Act.: 0

EB:

Ic limit [A]: 0
Ic Act.: 0

Ie limit [mA]: 0
Ie Act.: 0

Uc limit [V]: 0
Uc Act.: 0

Ue limit [V]: 0
Ue Act.: 0

- d. PID - this window enables configuring the PID parameters.

HEAT3 Control HEAT3 Setting HEAT3 Limits PID

PID auto tab

Temp [C]	P	I	D
50	100	50	1
150	110	40	1
200	120	30	1
250	130	20	1

new P: 100
new I: 50
new D: 1

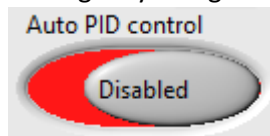
PID manual setting New PID request ☒

P	I	D
100	50	1

Auto PID control
Disabled

There are two ways to set the PID parameters:

- Setting only one global parameter regardless of temperature -

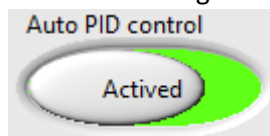


In this case, the parameters from the PID manual setting table are taken.

PID manual setting New PID request ☒

P	I	D
100	50	1

- Automatic change of the PID parameters depending on the temperature.



- active option for automatic change of the PID parameters

After activating this option, the PID parameters are taken from the PID table of the auto tab

PID auto tab

Temp [C]	P	I	D
50	100	50	1
150	110	40	1
200	120	30	1
250	130	20	1

The way of entering data into the table:

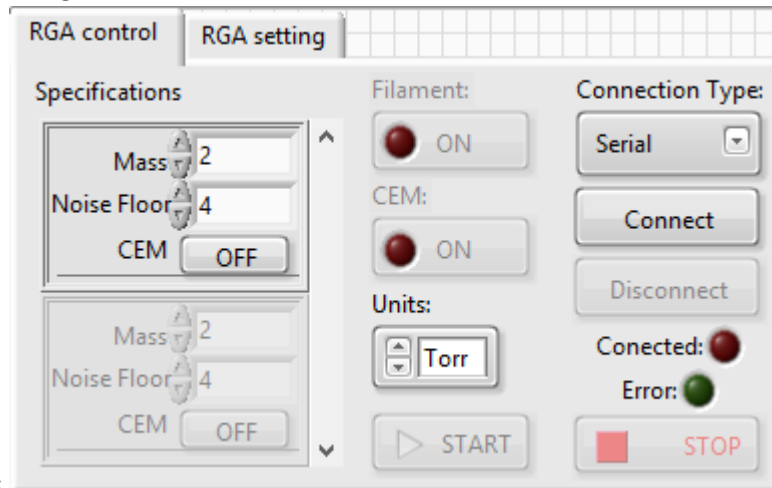
In the Temp column [C] - specify the temperature value for which the PID setpoints are optimal - Data should be entered in increasing order relative to temperature.

The PID parameters are changed when the current temperature is exactly between the individual values entered in the table, eg:

50	100	50	1
150	110	40	1

in this case, a change from the first parameters to the second parameters occurs when the current temperature exceeds 100C.

3. RGA control window - this part of the application is responsible for RGA control, and consists of two parts:
 - a. RGA control - this window enables establishing communication with the device, enabling/disabling filament and duplicator (CEM), in this window it is also possible to configure what masses we want to measure and with what

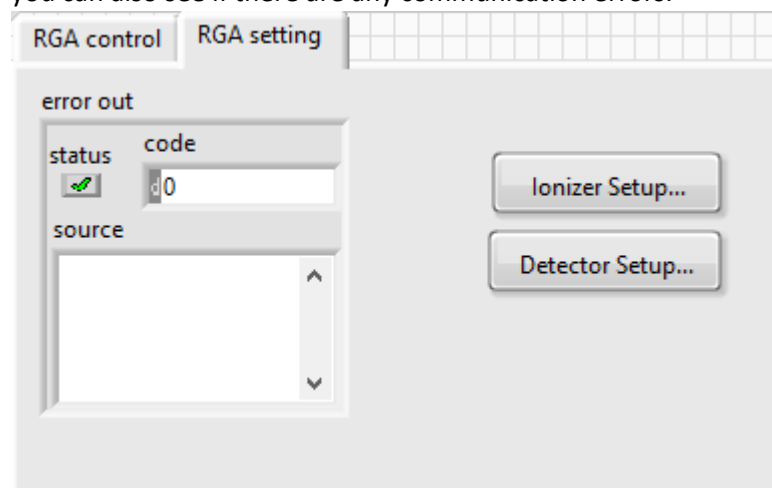


parameters.

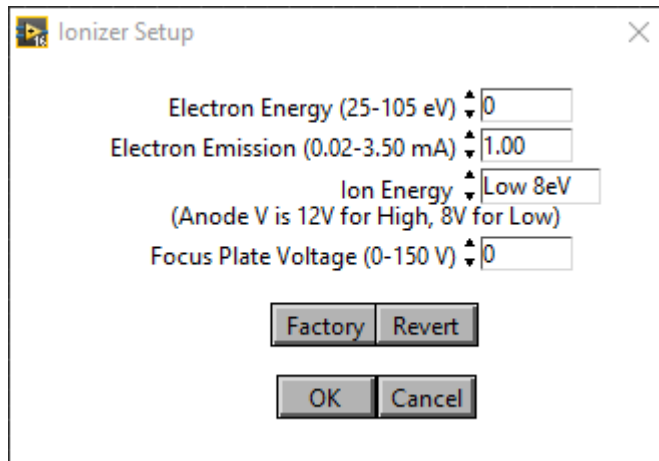
By pressing PPM on the Specifications table, you can delete/add selected masses.

Decreasing the value of the Noise Floor parameter has a negative impact on the time of data acquisition

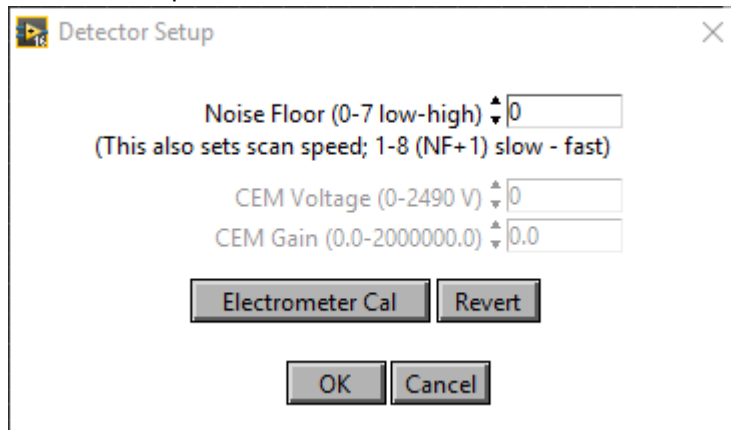
- b. RGA setting - In this window you can set the RGA configuration parameters, here you can also see if there are any communication errors.



Ionizer Setup:



Detector setup:



2. Graph control:

3. Troubleshooting:

a. **No communication with HEAT3**

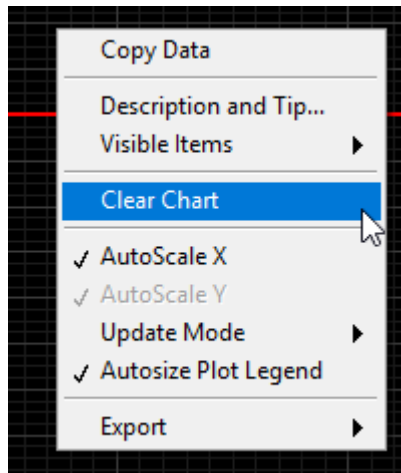
- enter a correct IP address in the HEAT3 setting tab, then stop the applications by pressing the STOP key - the process of stopping the application may last for several seconds - this is due to the lack of communication with the device. The application automatically saves the IP address when shutting down. At the restart, the application should automatically establish communication with the HEAT3 power supply

b. **When trying to connect to the RGA, an error occurs after a while**

- Probably an error occurred on the RGA, in order to reset it first disconnect the communication from the application with the Disconnect key in the RGA Control window, then turn off the RGA, wait 10-20s and then turn it on again. After this operation, after pressing the Connect key, the communication should be established and there should be no error.

c. **After a few days of the application's functioning, the graph refresh time slows down and the Loop Time value in the HEAT3 Setting tab is greater than 500ms**

- Graphs have too much historical data - they should be cleared by pressing the PPM and selecting the Clear Chart option



Graphs have a historical limit set to 1382400, but it is possible that on some computers (if there is not enough memory available) the number of these points should be reduced; to do this please contact us at the email address: software_support@prevac.pl.