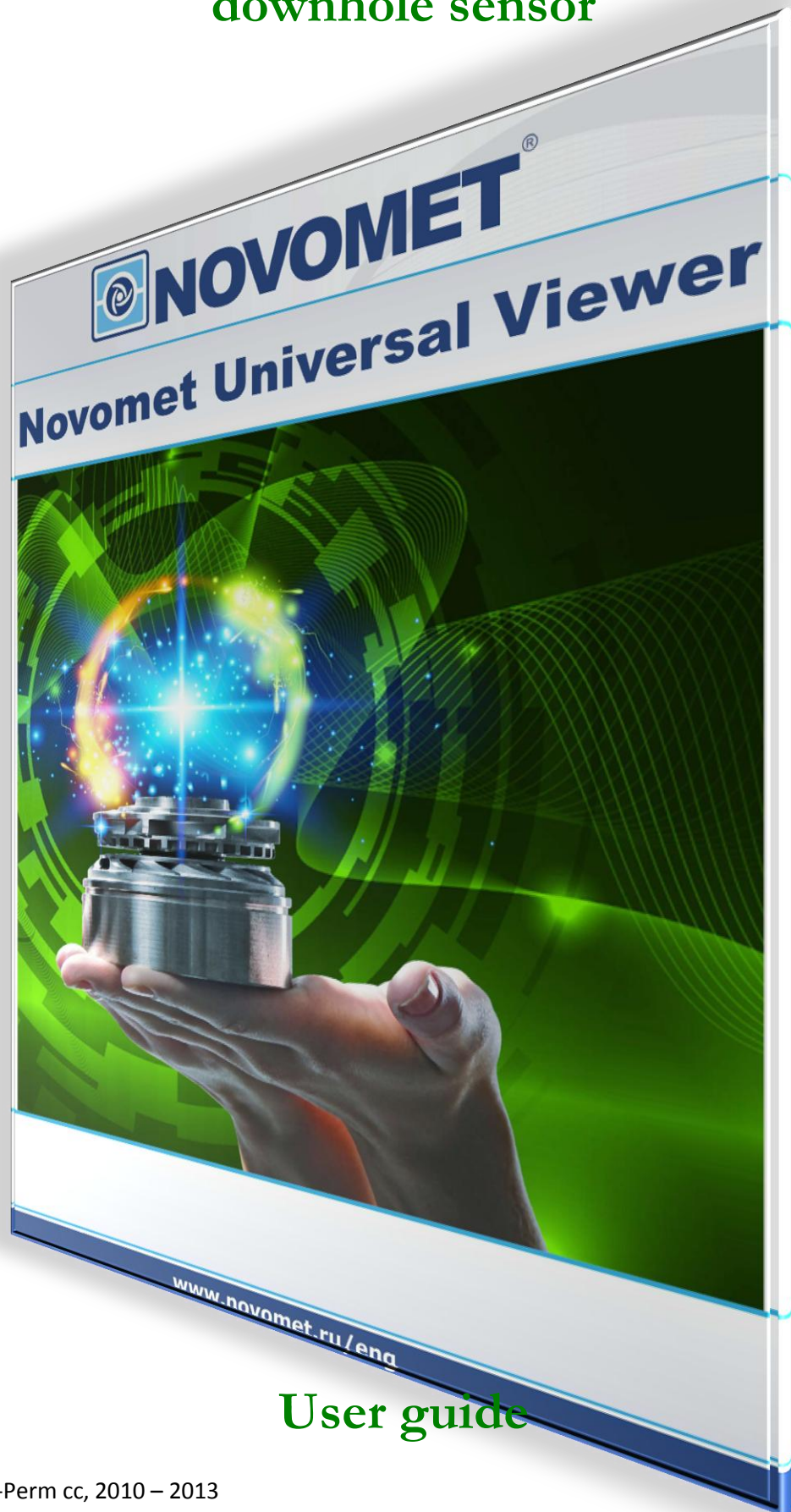


Log viewer and analyser for switchboard and downhole sensor



User guide

<http://www.novomet.ru/eng>

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1 Introduction

Novomet Universal Viewer is a software for viewing and analyzing logs of switchboards and downhole sensors produced by Novomet-Perm closed company. All hardware versions and all software versions are supported. The information from the logs is presented in the form of tables and graphs.

1.1 System requirements

Novomet Universal Viewer works in all Windows operating systems starting from Windows XP, both 32-bit and 64-bit. A display capable of 800x600 resolution with at least 16-bit color depth is required as well as a mouse or other positioning device. Keyboard is desirable. You need to be a local administrator in order to install the program.

There are no other requirements for using the program, but the size of logs that could be opened depend on available RAM. For example, a log of 1 million records takes up to 1.6 GB in RAM, and simultaneous operation of all options in all tabs of Novomet Universal Viewer is guaranteed provided that 5.3 GB of RAM are available. Windows XP RAM management places its own limitation on the size of the logs that can be opened: 1.1 million records for 32-bit system and 1.5 million records for Windows XP x64. Required RAM is proportional to the number of records in the log.

1.2 Which files are log files

Novomet Universal Viewer opens log files of Novomet switchboards with extensions «sude», «config», «curset», «sue» and «sud». Also, the program opens log files of Novomet downhole sensors with extensions «evt» and «tms».

If the log has extension «sude», just open the log.

If the log consists of four files with the same name and extensions «sude», «config», «curset» and «evp», open any of them except the «evp» one. The files «config», «curset» and «evp» might be hidden. All four have to be in the same folder.

If the log consists of many files with different names and extensions «sud», «sue», «sua», «evt» and «tms», open any of the «sud» or «sue» files. In this case all files in the folder are considered a single log. Please do not copy other files into this folder or Novomet Universal Viewer will add them to the same log.

1.3 How to open the log

You can open Novomet log files in Windows explorer or any other file manager simply by clicking to «Open» it just as you open any other document. Novomet Universal Viewer will start and the log file will be already opened in it.

Also, you can launch Novomet Universal Viewer first, and then press the button  or choose the menu item «Open log». After opening starts please wait until a data table shows up.

1.4 The program starts

Figure 1 shows how Novomet Universal Viewer looks when it starts. The look of the program window and the places of some buttons might depend on the skin you have chosen.

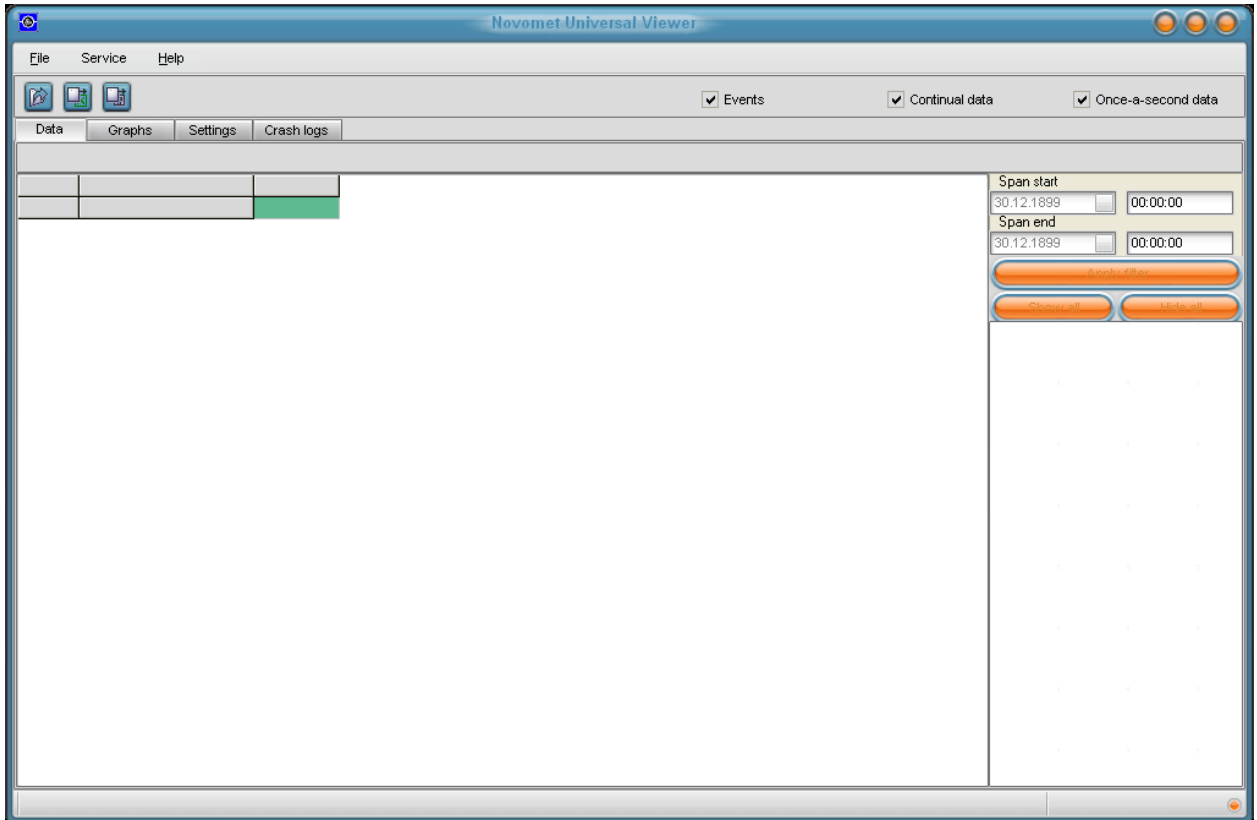


Figure 1. The way Novomet Universal Viewer looks after it starts. This skin is called «Novomet».

1.5 Tabs

The program is built of several independent tabs, each presenting different information from the same log. Tab navigation is done by left click on the tag of the tab. The tag of opened tab is highlighted. For example, Figure 1 shows the tab «Data».

The tab «Data» (Figure 2) has a range of table management tools that helps analysis of switchboard operation. It can show the records of different kinds (events, current data and once-a-second data), switch on and off different columns (motor frequency, etc.) and strings (time interval), export to Microsoft Excel.

The tab «Graphs» (Figure 3) has the tools for analysis of graphics: it can build one or several graphs versus one or several vertical axis, limit the time interval, zoom, scroll and save a picture to a file.

The tab «Settings» (Figure 4) shows settings as tree of tables.

The tab «Crash logs» (Table 5) shows the voltage at the switchboard input (three graphs of different shades of green which are read along the left coordinate axis) and current at the switchboard output (the red graph and the right coordinate axis).

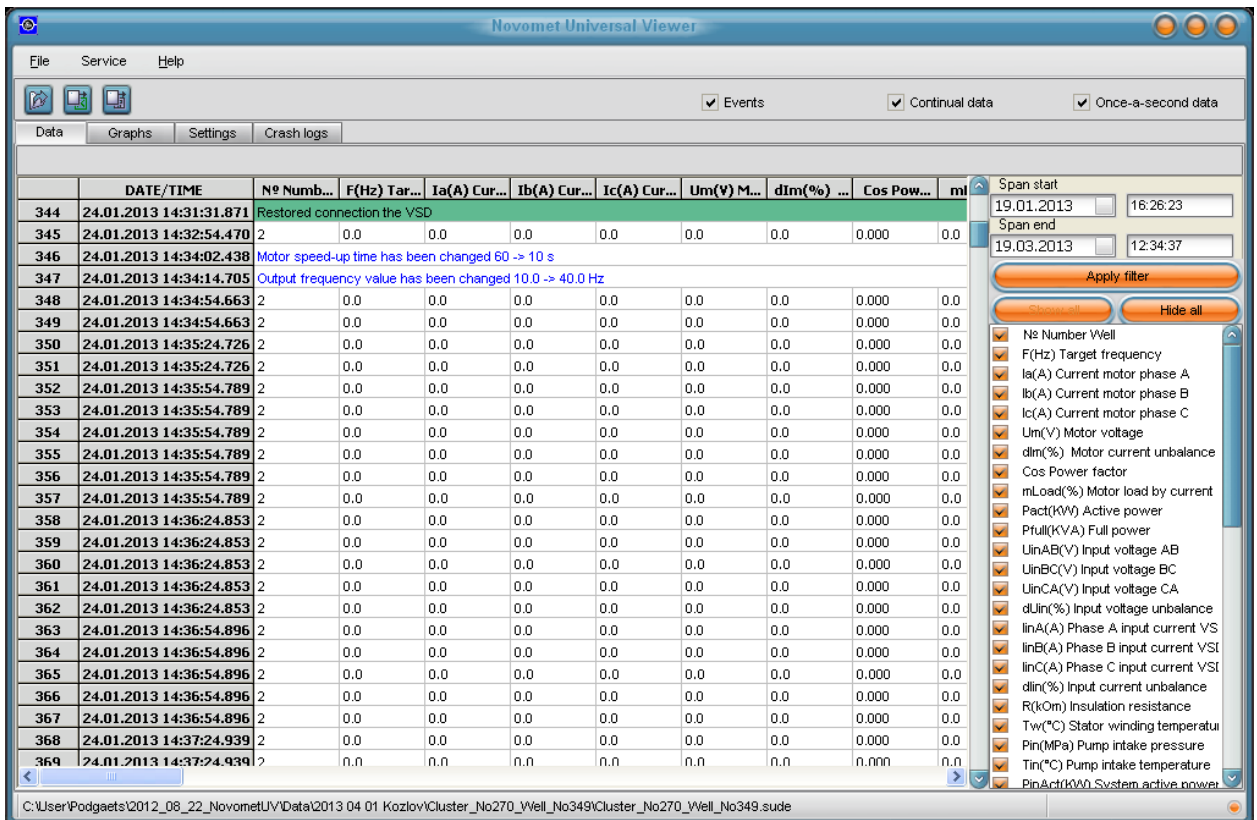


Figure 2. The tab «Data».

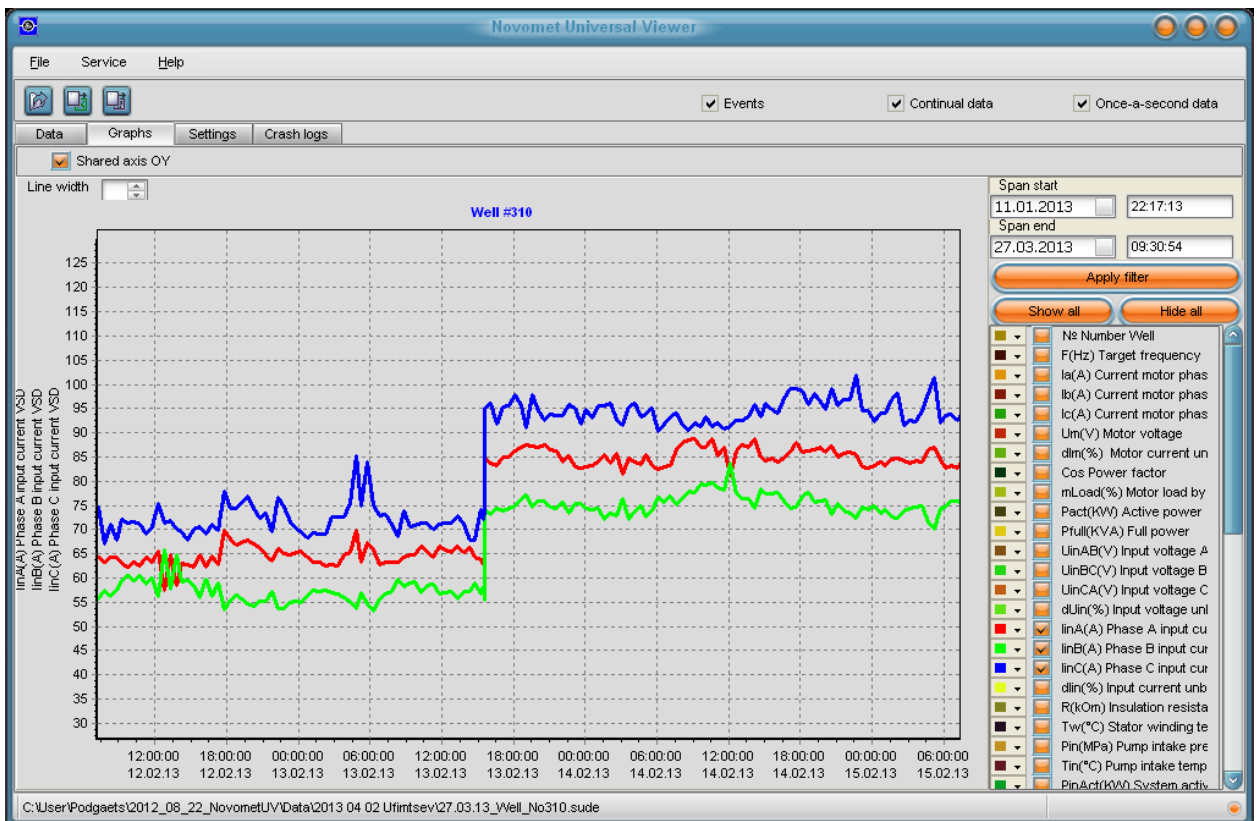


Figure 3. The tab «Graphs».

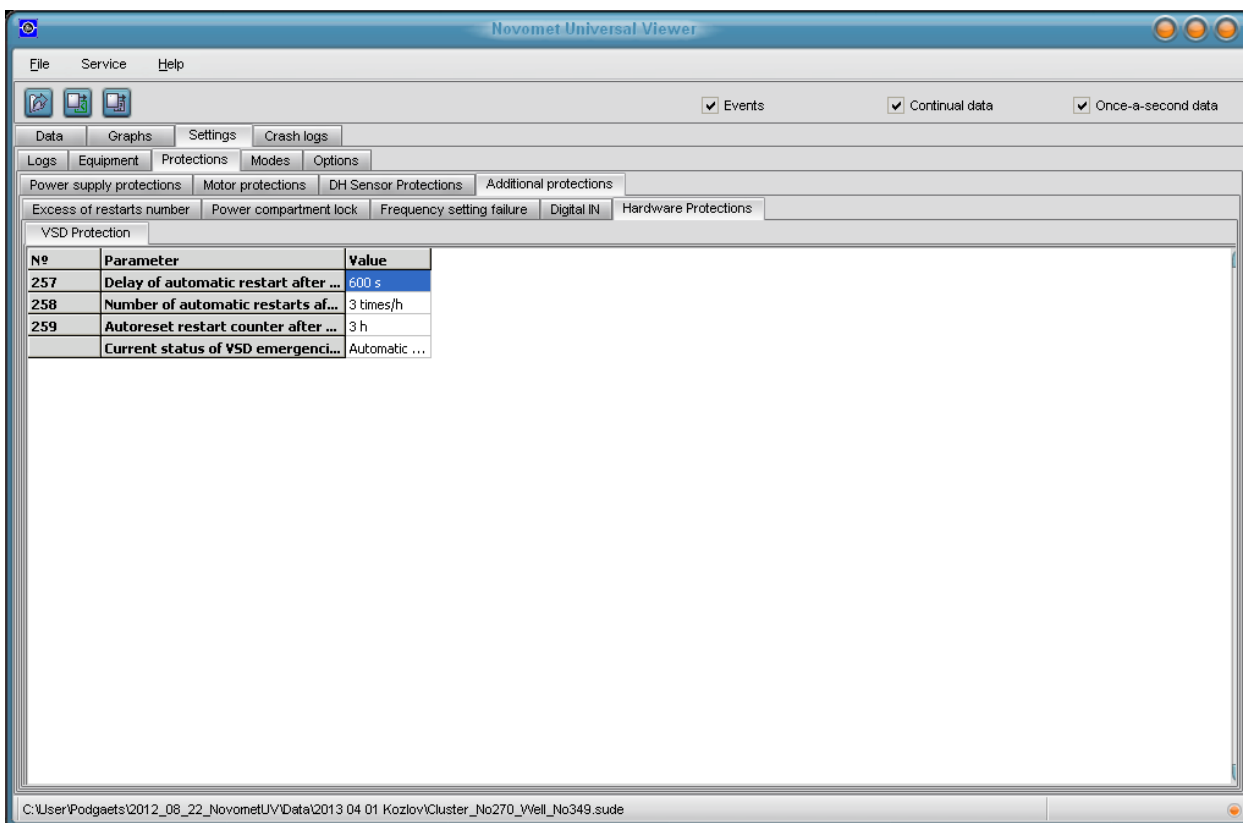


Figure 4. The tab «Settings».

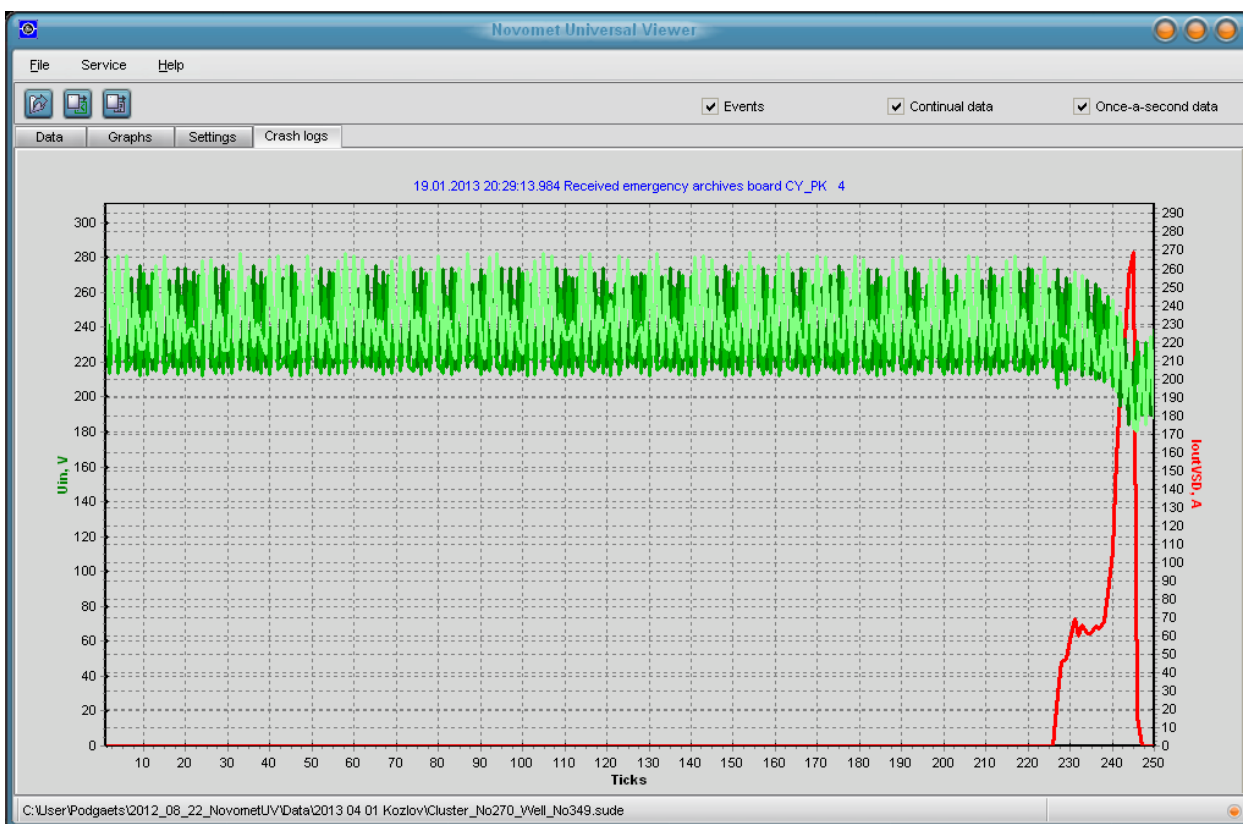


Table 5. The tab «Crash logs».

2 Menu

The work with Novomet Universal Viewer includes analyzing the data in tables and graphs in different tabs, each of them having their own tools for data analysis. Also, there is a menu which is always available. The menu includes most actions available in the program. Below is the structure of the menu.

2.1 File

This submenu includes all operations with files. Includes operations like loading the log, saving the log as Microsoft Excel file, saving the «Graphs» tab as a picture file and exit from the program.

2.1.1 Open log

This item shows a standard dialog for opening a file. The current open log closes, all tabs return to their initial state, then the log you have chosen shows up.

2.1.2 Export log to MS Excel

This item saves the tab «Data» and most settings as a file of Microsoft Excel (xls or xlsx depending on the version of Excel you have). The number of data sheets and the number of lines in each of them also depends on the version of Excel.

2.1.3 Save graphs

This item saves current view of «Graphs» tab as a picture file of either Joint Photographic Experts Group (JPEG), Windows metafile (WMF) or bitmap (BMP).

2.1.4 Exit

This item closes Novomet Universal Viewer.

2.2 Service

This item includes the choice of skin, language, measurement units and other settings of the program.

2.2.1 Themes

Skins in Novomet Universal Viewer are called themes. They affect the colors of the program window and the places of buttons «maximize», «restore» and «minimize». The standard installation file of Novomet Universal Viewer includes seven skins. 180 more (around 9 MB) are available upon request.

2.2.2 Language

This submenu switches the language from English into Russian and back. Switching the language changes program interface, not the data in archive. So events recorded in English will be shown in English and events recorded in Russian will be shown in Russian. If operator of switchboard was changing the language during operation, the parts of the log will be in different languages.

2.2.2.1 Russian

2.2.2.2 English

2.2.3 Measurement units

This submenu switches measurement units.

2.2.3.1 Vibration

2.2.3.1.1 mm/s

By default.

2.2.3.1.2 G

2.2.3.1.3 m/s²

2.2.3.1.4 mm/s²

2.2.3.2 Temperature

2.2.3.2.1 Degrees of centigrade

By default if the program was initially installed in Russian.

2.2.3.2.2 Degrees of Fahrenheit

By default if the program was initially installed in English.

2.2.3.3 Pressure

2.2.3.3.1 MPa

By default if the program was initially installed in Russian.

2.2.3.3.2 kgs/cm²

2.2.3.3.3 bar

2.2.3.3.4 psi

By default if the program was initially installed in English.

2.2.3.3.5 atm

2.2.4 Settings

2.2.4.1 Export to MS Excel

This submenu changes the time interval between records that are sent to Microsoft Excel. By default all records of «Data» tab will be exported to Microsoft Excel.

2.2.4.1.1 All data

By default.

2.2.4.1.2 Every 4 minutes

2.2.4.1.3 Every 5 minutes

2.2.4.1.4 Every 10 minutes

2.2.4.1.5 Every 15 minutes

2.2.4.1.6 Every 30 minutes

2.2.4.2 Mouse bindings in graph tabs

Sets the reaction of the program to left and right clicks in the tabs «Graphs» and «Crash logs».

2.2.4.2.1 Left button zooms, right button scrolls

By default.

2.2.4.2.2 Left button scrolls, right button zooms

3 The «Data» tab

The tab «Data» includes a data table of all parameters that were recorded during the operation of the switchboard (Figure 6) and tools for choosing columns and strings.

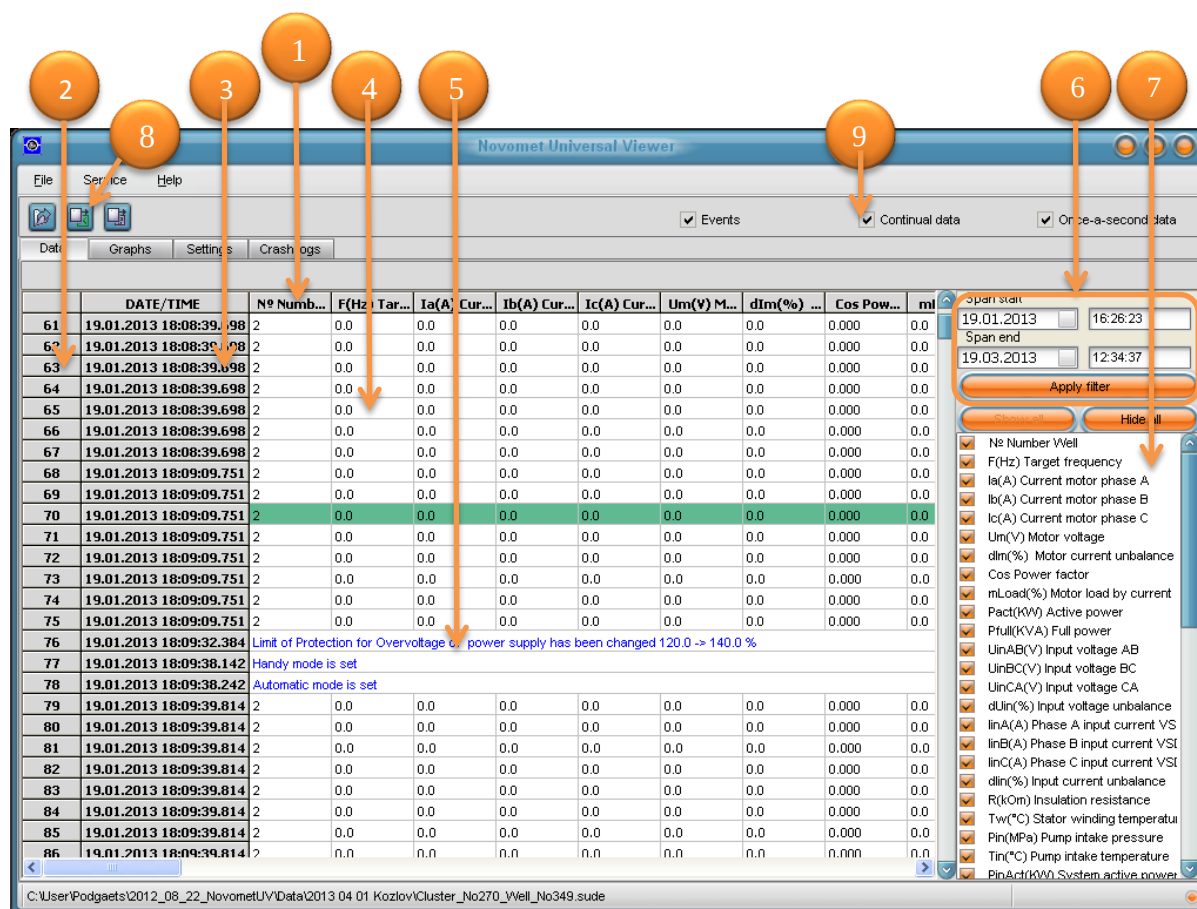


Figure 6. The tab «Data».

Numbers denote:

1 – the heading of the table. The width of all columns can be changed except for the first two. The heading changes when you uncheck the columns in the list to the right («7»).

2 – first column – this is nothing but an order number of the record on the screen

3 – second column – the date and time when event was recorded

4 – data columns

5 – events

6 – interval of time. By default the table shows all data and events of the log. By setting the time span you filter out only the data and events between the two moments of time. The date can be typed in or chosen in a dropdown calendar. Do not forget to «Apply filter». The time span of «Data» tab is automatically applied to «Graphs» tab.

7 – the list of parameters. By default the table includes all parameters that were recorded by the switchboard. You can uncheck the parameters you don't need and leave only those you need.

8 – button «Export to MS Excel». It is identical to «Export to MS Excel» in the menu

9 – the kinds of log records (see below)

3.1 The kinds of log records

There are three checked boxes to the right: «Events», «Current data» and «Once-a-second» data.

«Events» – all events, that is all text messages of switchboard controller.

«Current data» – the values of parameters of switchboard operation that are recorded by switchboard controller according to a timer that is set by operator.

«Once-a-second data» – the data that is recorded every second after protection alarm and until protection performs its action.

By default Novomet Universal Viewer shows all data of the log. By unchecking the boxes you choose what kind of data will be shown in the data table. The log is reread each time you check or uncheck these boxes, and the kind of records that you unchecked will not be present in all tabs of the program.

Crash log event is always shown.

This tool is available only for «SUDE» logs.

4 The «Graphs» tab

The tab «Graphs» includes graphic tools for data analysis (Figure 7). Here you can build graphs and change their look. The horizontal axis is always time axis. The vertical axis is always parameter axis. Zoom and scroll are described in 4.1 and 4.2.

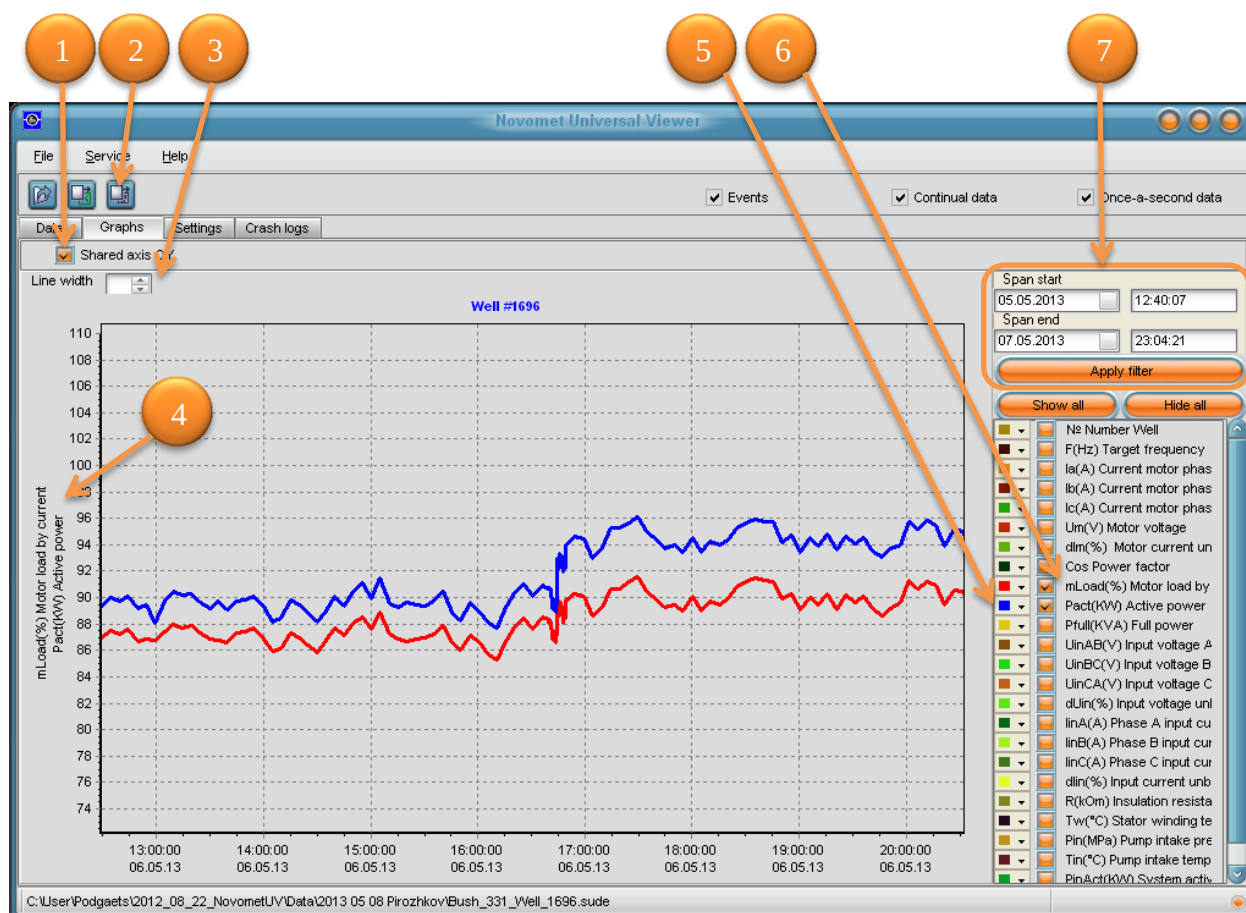


Figure 7. The tab «Graphs». Here motor load and active power are shown.

Numbers denote:

1 – The field «Shared OY axis». The number of pictures in the tab. By default the tab has one picture and all graphs are built in it, i.e. all graphs share the same reference frame. If you uncheck the «Shared axis OY», each graph will appear in its own picture with its own scale by OY axis. This will let zooming and scrolling every graph independently of others.

2 – The button «Save graphs in JPG» saves the picture as a **jpg**, **bmp** or **wmf** file.

3 – Line width is one by default. Figure 7 shows line width 3.

4 – The names of graphs.

5 – Colors of the graphs.

6 – The list of parameters allows checking and unchecking graphs in the picture.

7 – Time interval is shown in the box. By default the horizontal axis covers entire time span when the log has been recorded. Setting a different time span changes the scale in every picture of the tab. Do not forget to «Apply filter». Setting time span of «Graphs» tab do not affect the «Data» tab.

4.1 Scroll

By default graphs are scrolled by holding the right button of the mouse. This setting can be changed in the menu «Service» – «Settings» – «Mouse bindings in graph tabs».

If the box «Shared OY axis» is unchecked each graph can be scrolled independently. The time span will be the same for all graphs though – only the starting date and time will be scrolled.

4.2 Zoom

By default graphs are zoomed with the left button of the mouse. This setting can be changed in the menu «Service» – «Settings» – «Mouse bindings in graph tabs».

Zoom is done by choosing a rectangle which becomes a new picture of the tab. Press the mouse button in the lower left corner of the rectangle, hold it while moving the mouse and release it in the upper right corner of the rectangle. If you want to choose a shorter time span, choose a short high rectangle including the minimal and maximal values along the OY axis. It will not affect the time span for entire «Graphs» tab. If you want to reduce the scale while preserving the time span, choose a wide low rectangle including the first and last moments along the time axis.

Choosing the corners in the reverse order cancels all zoom and scroll and returns all graphs to initial scale. This is also true if the box «Shared OY axis» is unchecked.

5 The «Settings» tab

The tab «Settings» shows switchboard settings as a set of tables (see Figure 8 for one of them).

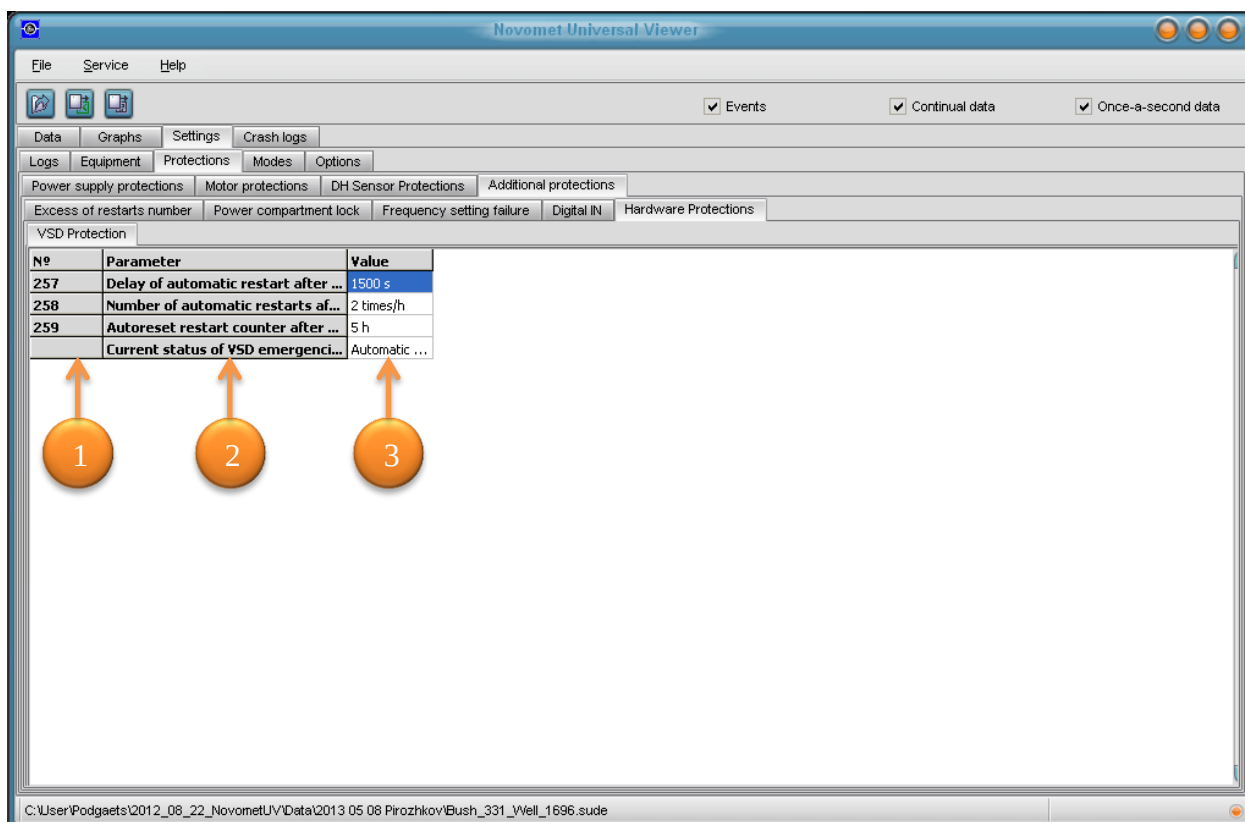


Figure 8. The «Settings» tab. Here the settings for «VSD protection» are shown.

Numbers denote:

- 1 – The number of parameter according to the register map of Novomet switchboards.
- 2 – The name of the setting. Full name hides in the hint.
- 3 – The value of the setting. The width of this field can be changed.

The list of subtabs of the «Settings» tab is presented below.

5.1 Logs

#	name	units
10	Switchboard archives period	s
11	Alarm archives period	s
12	Amount of alarm records	

5.2 Equipment

5.2.1 Notes

#	name
8	Number bush
9	Number well
390	Oilfield number

5.2.2 Switchboard

#	name	units
20	Switchboard serial number	
21	Power meter voltage factor	
22	Nominal current	A
23	Transformation current factor	
453	Presence of output filter	
454	Capacitance of output filter	mkF
455	Inductance of output filter	mH

5.2.3 Step-up transformer

#	name	units
23	Transformer power	kVA
24	Transformer input voltage	V
25	Transformer tap	V
26	Cable length	m
27	Input voltage	V
28	Input frequency	Hz
42	Maximal tap of step-up transformer	V
105	Maximal operational frequency	Hz
106	Cable section	mm ²

5.2.4 Motor

#	name	units
31	Nominal motor power	kW
32	Nominal motor voltage	V
33	Nominal motor current	A
34	Nominal motor frequency	Hz
35	Nominal motor speed	rpm
36	Nominal motor efficiency	
37	Nominal power factor	
456	Motor inductance	mH
457	Inductive resistance of the motor	Ohm

5.2.5 VSD

#	name	units
30	Motor type	
40	Rotation direction	
41	Motor lower speed limit	Hz
42	Motor upper speed limit	Hz
43	Fixed motor speed	Hz
44	Motor dispersal time	s
45	Motor delay speed	s
46	PWM frequency	kHz
47	U/F characteristic U	V
53	U/F characteristic F	Hz
150	VSD start mode	
151	Forward swing frequency	Hz
152	Reverse swing frequency	Hz

153	Push voltage for swing start	%
154	speed-up time for swing start mode	s
155	VSD slowdown time	s
156	Number of pushes for swing start mode	
157	The limit of current for swing start	%
158	Synchronisation time	s
159	Synchronisation frequency	Hz
41	Maximal operational voltage of VSD	V
60	Filter time of current regulator	ms

5.2.6 DH Sensor typ

#	name
70	DHS type

5.2.7 Hardware

#	name
6	Circuit input voltage schema
22	VSD type
27	Power meter type
28	Archive parameters map
450	Output current factor of phase U
451	Output current factor of phase V
452	Output current factor of phase W

5.3 Protections

5.3.1 Power supply protection

5.3.1.1 High supply voltage

#	name	units
201	Overvoltage	%
202	Activation delay	s
203	Delay of response	s
204	Delay of automatic restart	s
205	Restart when voltage is at least	%
	Current status of overvoltage protection	

5.3.1.2 Low supply voltage

#	name	units
59	Mains voltage at mains fault	V
61	Minimal mains voltage	V
206	Undervoltage	%
207	Activation delay	s
208	Delay of response	s
209	Delay of automatic restart	s
210	Restart when voltage is at least	%
	Current status of undervoltage protection	

5.3.1.3 Voltage imbalance

#	name	units
---	------	-------

211	Voltage imbalance	%
212	Activation delay	s
213	Delay of response	s
214	Delay of automatic restart	s
215	Restart when voltage is at least	%
	Current status of voltage imbalance protection	

5.3.2 Motor protections

5.3.2.1 Overload

#	name	units
218	Overload	%
219	Activation delay	s
220	Delay of response	s
221	Delay of automatic restart	s
222	Automatic counter restart	h
223	Number of automatic restarts	times/h
224	Protection objective	
	Current status of motor overload protection	

5.3.2.2 Underload

#	name	units
225	Motor underload	%
226	Activation delay	s
227	Delay of response	s
228	Delay of automatic restart	s
229	Automatic counter restart	h
230	Number of automatic restarts	times/h
231	Protection objective	
	Current status of motor underload protection	

5.3.2.3 Maximal current

#	name	units
216	Number of automatic restarts	times/h
217	Automatic counter restart	h
	Current status of maximal current protection	

5.3.2.4 Backspin

#	name	units
232	Maximal backspin frequency setting	Hz
	Current status of backspin protection	

5.3.2.5 Protection from imbalance

#	name	units
400	Maximal imbalance	%
401	Activation delay	s
402	Reaction delay	s
403	Restart delay	s
404	Restart counter is reset after	h
405	Number of reactions in a row	times/h

Current status of protection from motor currents imbalance

5.3.2.6 *Out of synchronisation protection*

#	name	units
500	Minimal cosine	%
501	Activation delay	s
502	Reaction delay	s
503	Restart delay	s
504	Restart counter is reset after	h
505	Number of reactions in a row	times/h

5.3.3 *DH Sensor Protections*

5.3.3.1 *Pump intake pressure*

#	name	units
240	Minimal intake pressure setting	MPa
241	Activation delay	s
242	Delay of response	s
243	Delay of automatic restart	s
244	Objective for automatic restart	
245	Restart when pressure is	MPa
246	Automatic counter restart	h
247	Number of automatic restarts	times/h

Current status of protection from low pressure on pump intake

5.3.3.2 *Motor overheat*

#	name	units
248	Maximal stator temperature setting	deg C
249	Activation delay	s
250	Delay of response	s
251	Delay of automatic restart	s
252	Restart when motor temperature is at most	deg C
253	Automatic counter restart	h
254	Number of automatic restarts	times/h

Current status of protection from motor overheat

5.3.3.3 *Insulation resistance*

#	name	units
238	Minimal insulation resistance setting	kOhm
239	Delay of response	s

Current status of protection from low insulation resistance

5.3.4 *Additional protections*

5.3.4.1 *Excess of restart number*

#	name	units
255	Time period	h
256	Maximal number of automatic restarts	times

Current status of protection from high number of starts per day

5.3.4.2 Power compartment lock

#	name	units
	Current status of protection from opening power compartment	

5.3.4.3 Frequency setting failure

#	name	units
233	Frequency setting failure setting	Hz
234	Delay of response	s
235	Delay of automatic restart	s
236	Automatic counter restart	h
237	Number of automatic restarts	times/h
	Current status of rotation frequency failure protection	

5.3.5 Hardware Protections

5.3.5.1 VSD Protection

#	name	units
257	Delay of automatic restart	s
258	Number of automatic restarts per hour	times/h
259	Automatic counter restart	h
	Current status of VSD emergencies processing	

5.4 Modes

5.4.1 Cyclic

#	name	units
101	Work time	s
102	Pause time	s

5.4.2 Frequency alternation

№	название	единицы измерения
120	Frequency 1	Hz
121	Frequency 2	Hz
122	Time period working on Frequency 1	s
123	Time period working on Frequency 2	s

5.4.3 Programmed frequency change

#	name	units
103	Starting frequency	Hz
104	Ending frequency	Hz
105	Frequency change period	s
106	Period of frequency change by 0.1 Hz	s
134	Type of start	
141	Underload setting	5

5.4.4 Holding parameter

#	name	units
107	Type of supported parameter	
108	Dependence type	

109	Parameter value for supported parameter mode	
110	Regulator period	s
111	Ratio	
112	Integral factor	

5.4.5 Shaking

#	name	units
113	Frequency 1	Hz
114	Frequency 2	Hz
115	Pause for shaking mode	min
116	Number of shakes	
117	Frequency increasing speed	Hz/s
118	Frequency decreasing speed	Hz/s
119	Shake time period	s

5.5 Options

5.5.1 Modbus

#	name
90	Slave Modbus addres
91	Slave comport baudrate
92	Slave comport parity
93	Slave comport stopbits
94	Slave comport delay
264	Modbus map type

5.5.2 Measurement units

#	name
3	Pressure measuring units
4	Temperature measuring units
5	Vibration measuring units

5.5.3 About the system

#	name
7	Software version number

5.5.4 Other settings

#	name	units
1	Active language interface	
2	Using passwords	
71	DHS Modbus address	
72	DHS speed	
73	Liquid viscosity	sSt
74	Factor k0	
75	Factor k1	
76	Pump number in database	

6 The «Crash logs» tab

Crash logs are recorded when the crash event is received from the crash logs cardboard inside the controller of Novomet switchboard. This event is shown in «Data» tab as a red text in Figure 9. This event is shown even when the events are hidden by unchecking «Events» in the common panel.

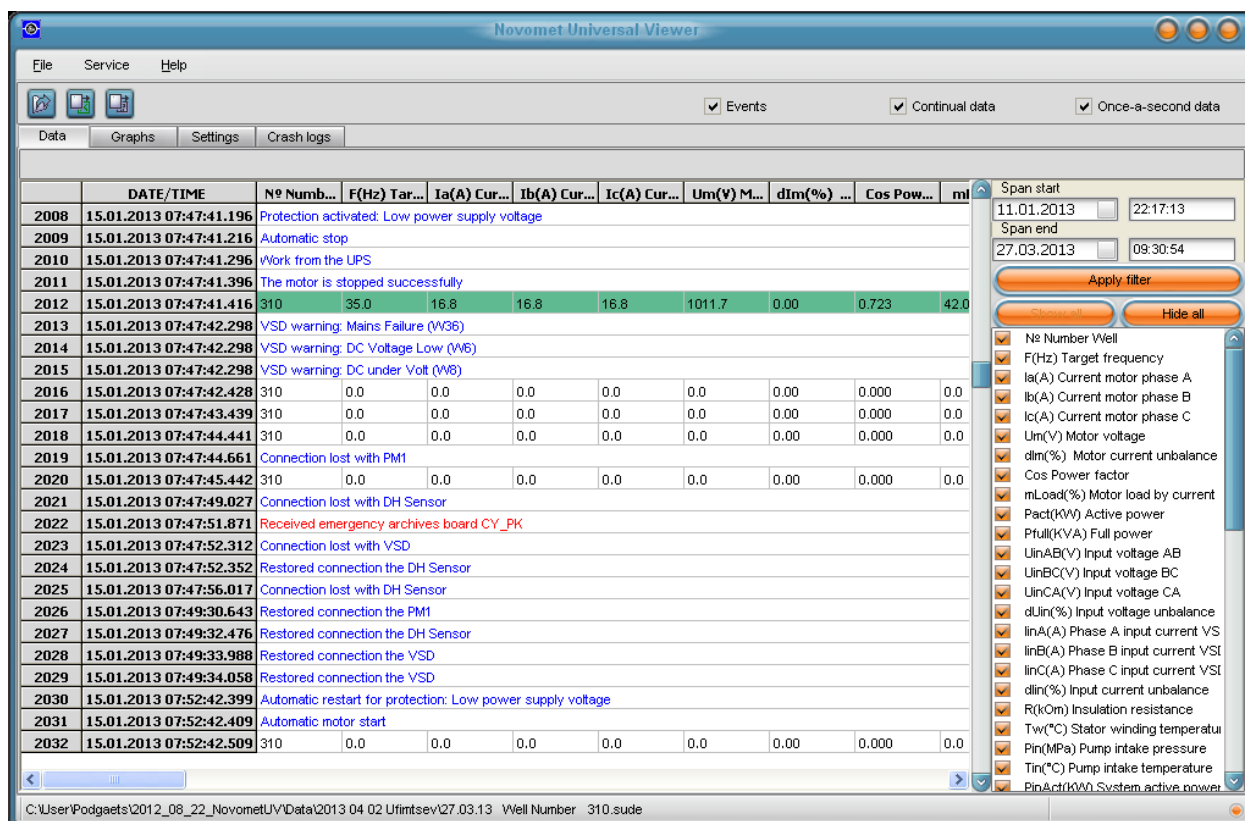


Figure 9. The way crash event looks in «Data» tab.

Crash log is a record of a few crucial parameters of power supply and power output in the last few seconds before the crash event. The time of crash event is the time of the last tick of the crash log.

Four parameters are recorded: three linear interphase voltages at the input of power meter and current at the output of VSD before the sinusoidal filter, that is linear interphase voltages at the input of the switchboard and current at the output of the switchboard.

The time units of a crash log are ticks of a timer. The time between ticks is mains voltage period (20 ms for 50 Hz and 16.667 ms for 60 Hz). The length of a crash log is 250 or 500 ticks. See the length of a crash log in seconds in Table 1.

Click the crash event in «Data» tab, and Novomet Universal Viewer activates «Crash logs» tab and opens the crash log you have chosen (Figure 10). The picture of «Crash logs» does not change until you choose a different crash event in «Data» tab.

Table 1. The length of crash logs in seconds.

Number of timer ticks	Mains frequency	
	50 Hz	60 Hz
250	5 s	4,167 s
500	10 s	8,333 s

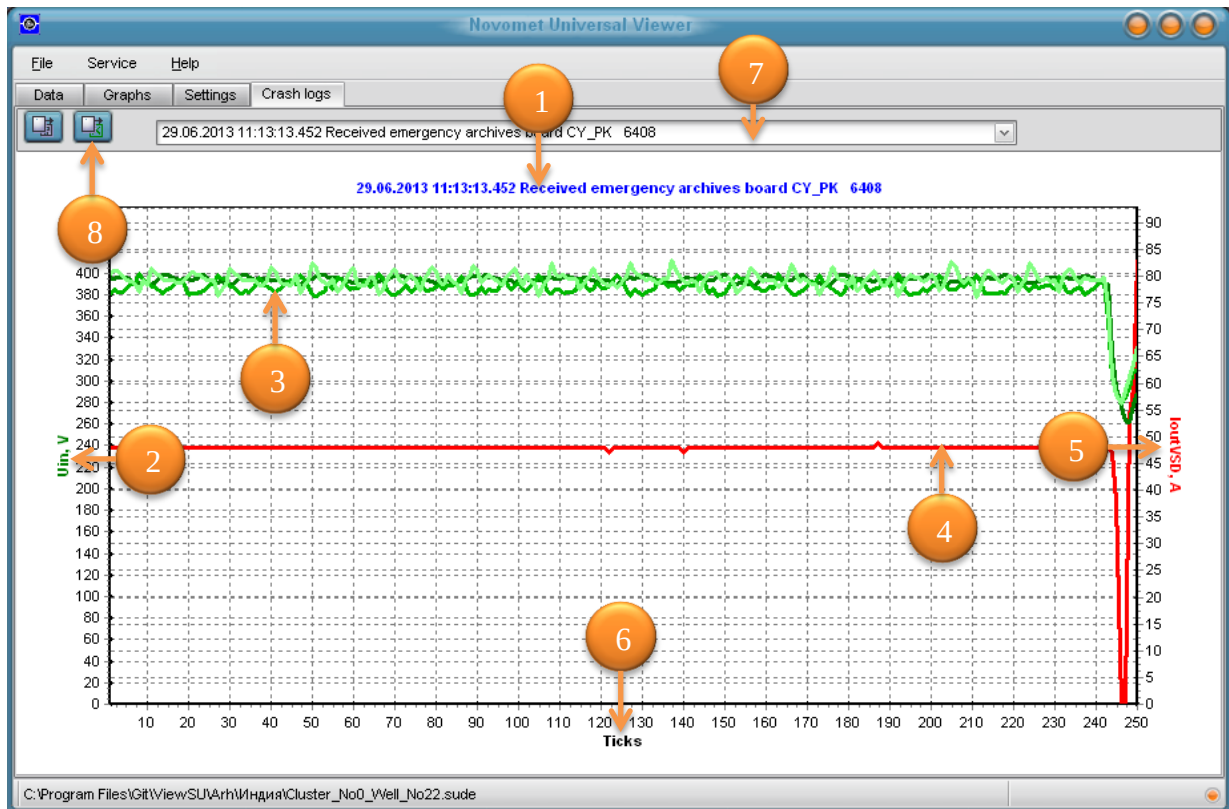


Figure 10. The tab «Crash logs»

Numbers denote:

- 1 – The message of crash event from the «Data» tab.
- 2 – The voltage scale at the input of power meter (at the input of Novomet switchboard).
- 3 – Green graphs show linear interphase voltages between phases at the input of the power meter. The units are Volts:
 Light green graph shows linear voltage between phases A and B;
 Green graph shows linear voltage between phases B and C;
 Dark green graph shows linear voltage between phases C and A.
- 4 – Red graph shows current at the output of VSD but before the sinusoidal filter (at the output of Novomet switchboard). The units are Amperes.
- 5 – The scale of current at the output of VSD.
- 6 – The time scale in timer ticks (in mains periods).
- 7 – The drop-down list of all crash logs in this data and event log.
- 8 – Buttons «Save graphs to JPG» and «Export to MS Excel» save and export the crash log which is currently on the screen.

The picture of «Crash logs» tab can be zoomed and scrolled the same way as the picture of the «Graphs» tab – see chapters 4.1 and 4.2). The mouse buttons used for zoom and scroll are the same for the two tabs and can be changed using menu: «Settings» – «Mouse bindings in graph tabs».



Switchboard “Novomet”, Downhole sensor “Novomet”,
Novomet Universal Viewer and this user guide

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