



Wind turbine remote control and monitoring system

ZEFIR-SCADA

User's guide



ENGLISH VERSION / WERSJA ANGIELSKA

v. 1.4

ZEFIR-SCADA remote control and monitoring system is a software built using modern web pages technology and is used for the two way communication between user and ZEFIR wind turbines. With the Internet access operator can remotely start and stop wind turbine, view its actual parameters, check local atmosphere data, or even look through recorded historical information from the chosen periods of time. All of these functions are available from both desktops as well as mobile devices such as mobile phones or tablets with access to the Internet.

This manual is meant to show the user how to quickly and easily get the remote access to the operating parameters of your power plant. After reading this document, he will be able to:

- connect to the ZEFIR-SCADA system from any device connected to the Internet,
- check the connection safety,
- correctly log on to the control system,
- analyze recorded operating parameters of power plant (both current and historical),
- properly navigate in the the area of the main graph,
- assess the power plant condition on the basis of the list of displayed "remarks" and "faults",
- remotely start and stop the wind turbine,
- safely leave the control system / log out properly.

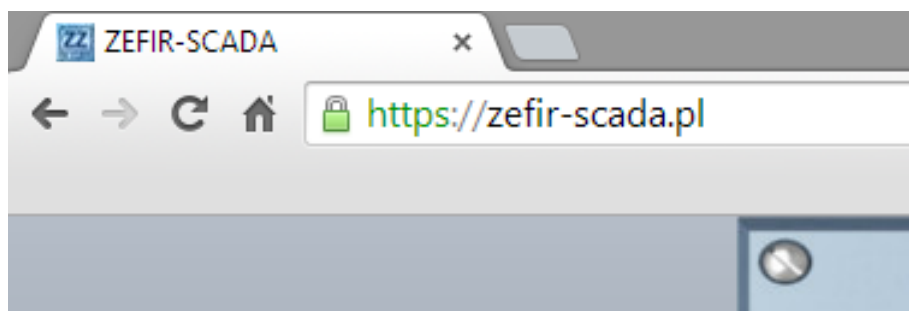
Despite the high ergonomics and ease of use of the system, before working with the ZEFIR-SCADA software, manufacturer recommends to read this document in its entirety. Not all displayed information, methods of signaling the power plant operating states, or capabilities of individual sections are obvious and visible immediately after logging into the system. Omitting to read this instruction may result in a lack of understanding of certain features and even a misinterpretation and incorrect conclusions deduced during operation with the software. Therefore...

...we invite for the reading

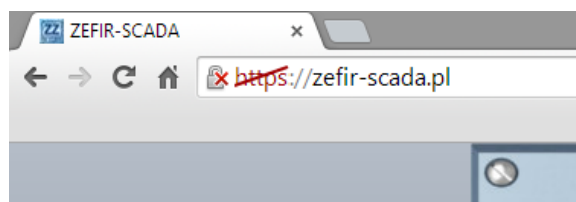
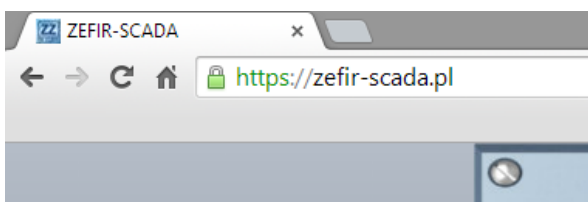
DR ZĄBER Team



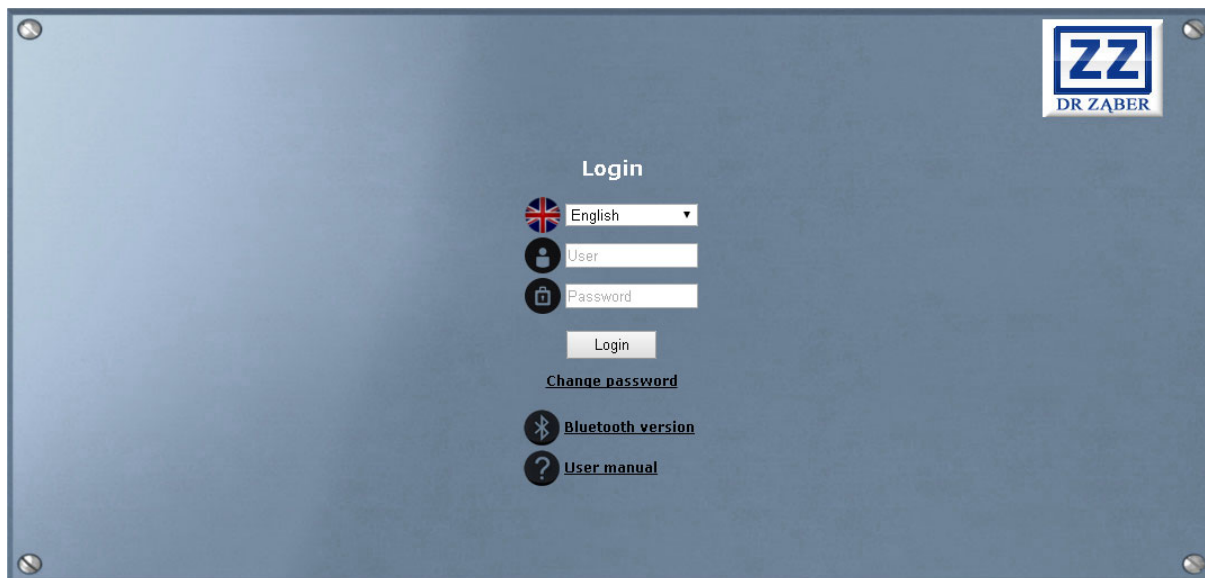
1. The first step to get the remote access to the ZEFIR wind turbine (through a ZEFIR-SCADA system) is to launch a web browser on the device connected to the Internet. In the address bar, enter one of the following options, and then press the confirmation button (usually ENTER or OK):
 - c) `www.zefir-scada.pl`
 - d) `zefir-scada.pl`



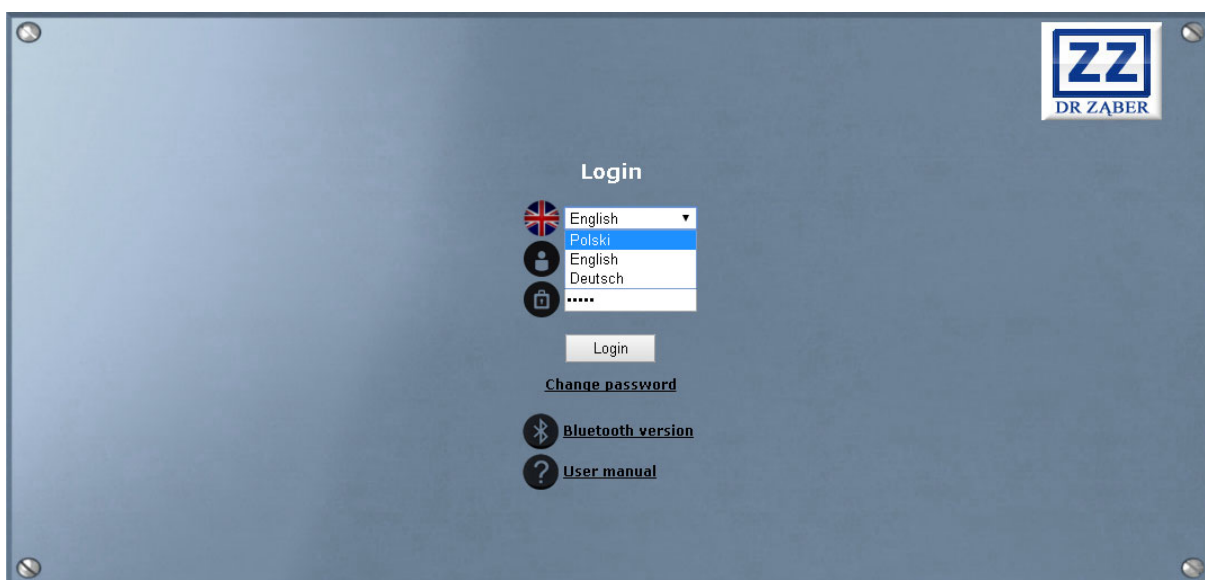
2. Make sure that the address bar displays the symbol of a secure, encrypted connection. Depending on the browser, the symbol can vary, but it is usually a symbol of a padlock. The connection with the ZEFIR-SCADA website is protected by encryption using the 128-bit security key. On startup, website presents to the browser a certificate confirming the safety an encrypted connection. "Warning" or "crossed out" appearance of a padlock indicates the occurrence of a problem with the certificate and usually inadequately protected connection. In this case, you should avoid logging into the SCADA system and report this fact via e-mail or phone to the manufacturer of the turbine



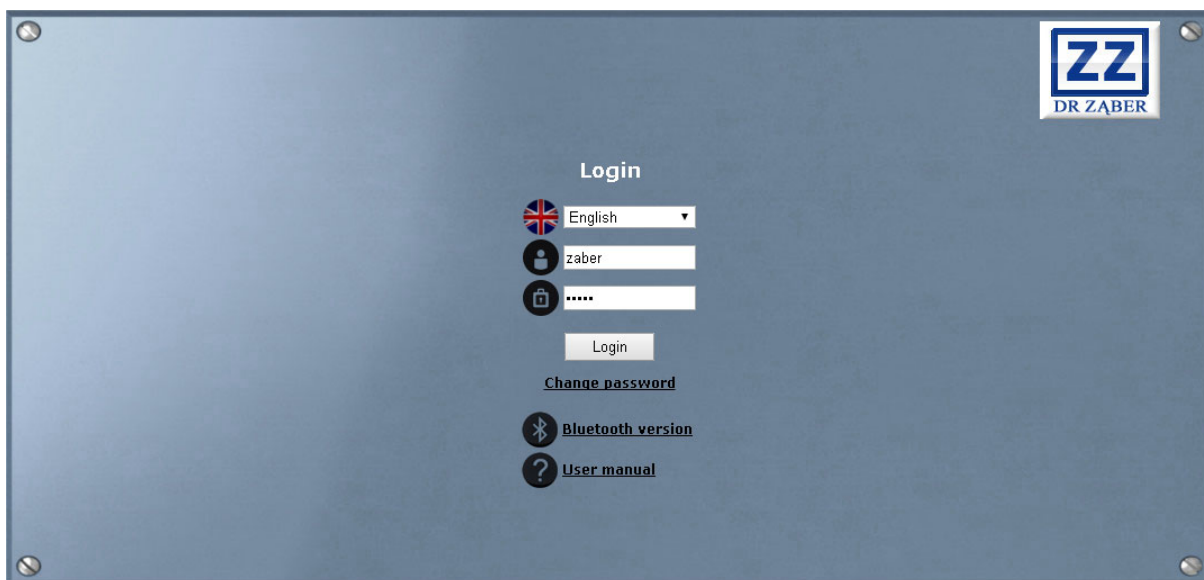
3. After correctly entering the address of a website and verifying the presence of a secure connection, you can go to the ZEFIR-SCADA system login screen:



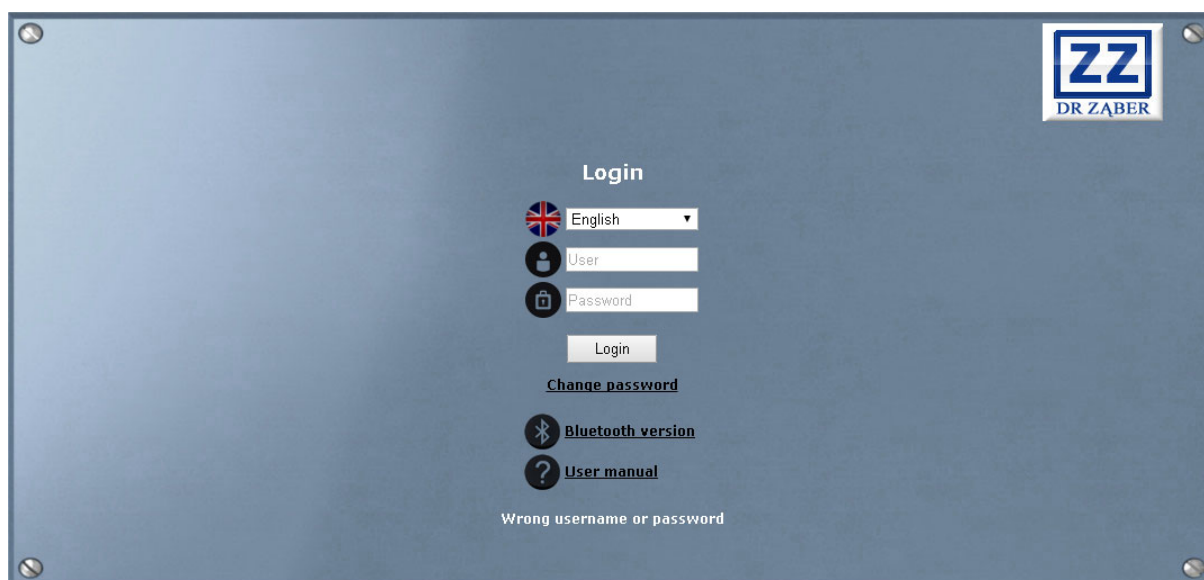
4. Select the language of the ZEFIR-SCADA system.



5. In the first of two available fields, enter the User name given by the turbine manufacturer, in the second field enter the received Password, and then click „Login” button.



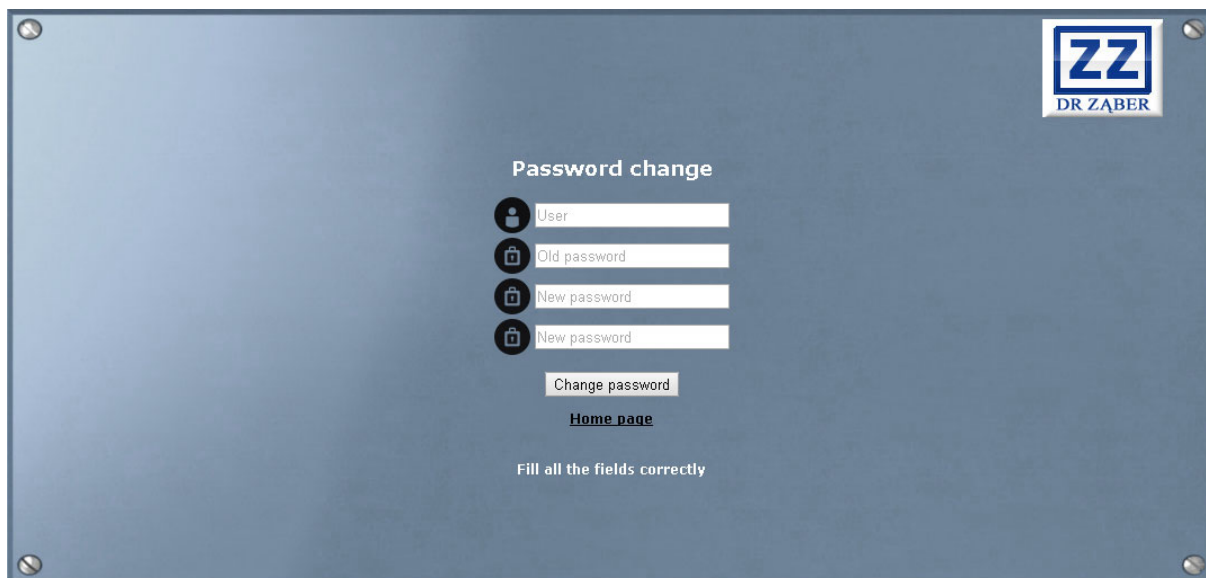
6. If a mistake was made when entering a User name or Password in the previous steps, then the system displays additional information:



In case of username or password loss, for security reasons, you can recover it only through contact with the turbine manufacturer.

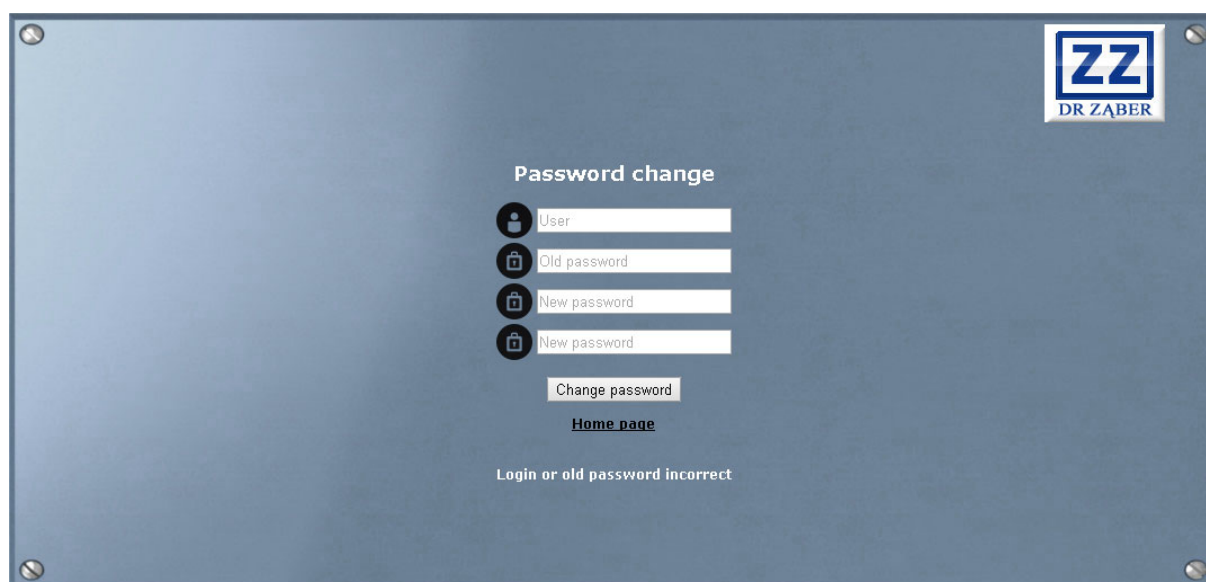


7. In order to change the old password for a new one, click the "Change password" link and fill out the form correctly. In case of missing data in any of the fields, the system will display an error message.



The screenshot shows a web interface for changing a password. In the top right corner is the logo for 'ZZ DR ZÄBER'. The main heading is 'Password change'. Below it are four input fields, each with a lock icon on the left: 'User', 'Old password', 'New password', and 'New password'. Below the fields is a 'Change password' button and a link labeled 'Home page'. At the bottom, a message reads 'Fill all the fields correctly'.

8. Entering an incorrect username or password will result in displaying additional information.



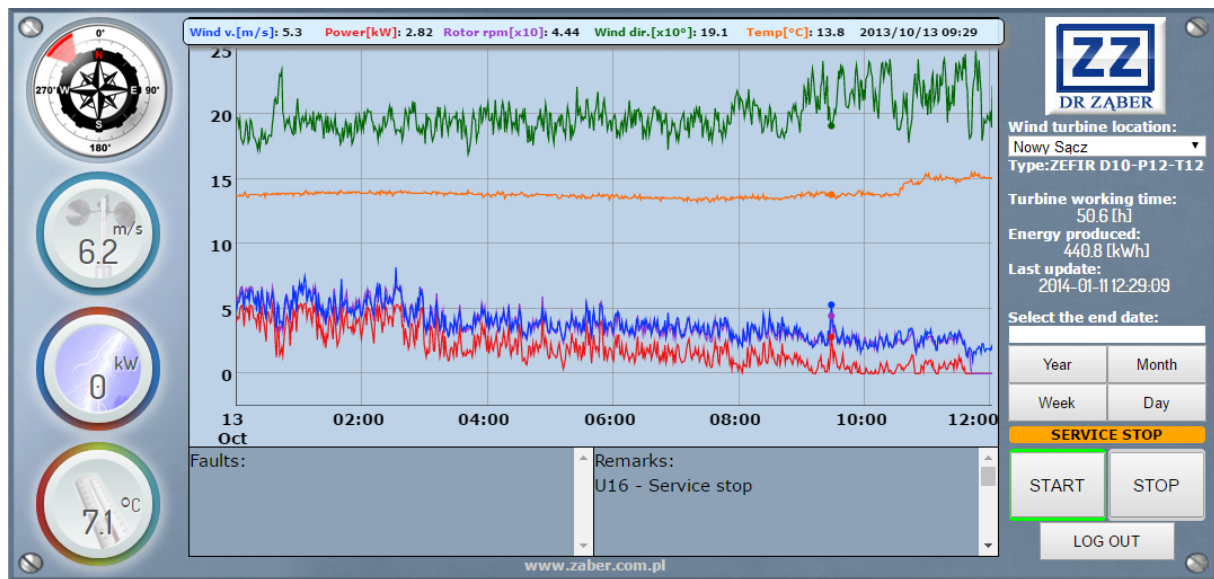
This screenshot shows the same 'Password change' form as before, but with an error message at the bottom: 'Login or old password incorrect'. The 'Home page' link and the 'Change password' button are still visible above the error message.

9. After properly completing the form and confirming it by pressing the "Change password" button, system will display the following message:

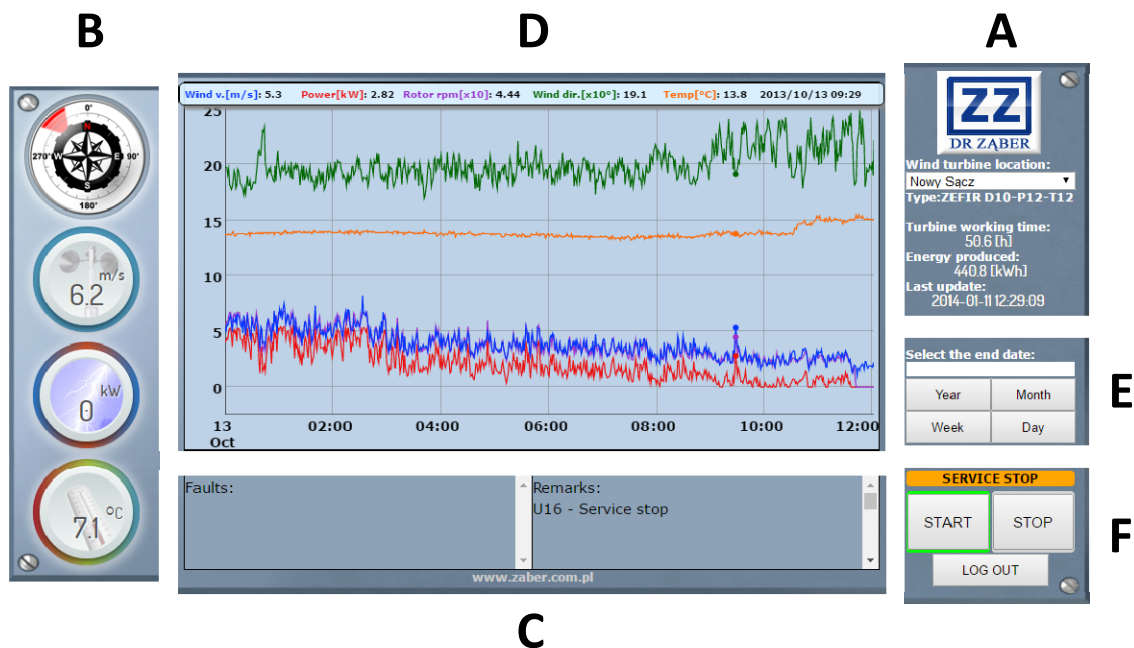
Password was changed



10. After successful login, the main screen of ZEFIR-SCADA system will be displayed:



11. ZEFIR-SCADA Control Panel is divided into 6 main sections:

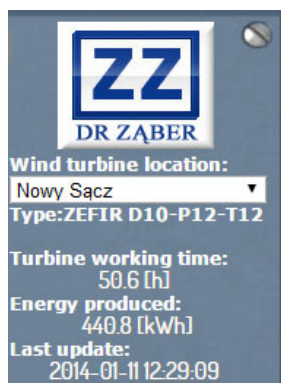


Data from the the power plant are saved to the database every 1 minute. Sections A, B, C show the most current parameters, refreshed (checked) by the system every 10 seconds. Section D is a mixed section, because it displays the actual parameters with the refresh of the displayed data every 5 minutes or displays the historical parameters, selected by using the section E. The final element of the ZEFIR-SCADA system is section F, which is the control section, refreshed every 10 seconds.



12. The functions of individual sections:

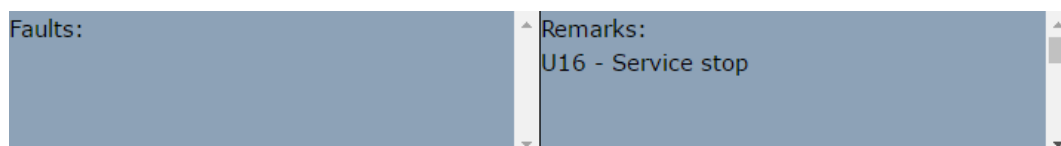
- A) This section allows you to select the location of the power plant (active with several locations) and an overview of the current time of its work, produced energy and the date of last update. Refresh time: 10 seconds.



- B) This section contains the latest information about the wind speed and direction, the turbine power achieved under these conditions and the value of the ambient temperature. Refresh time: 10 seconds.



- C) This section has been divided into two columns. The „Faults” column displays information about the problems reported by the turbine internal control system. The second column called "Remarks" contains information about the actions taken by the PLC on the basis of the recorded signals by. Refresh time: 10 seconds.



List of „Faults”:

Displayed message	Description
A01 – Controller internal error	Improper operation of turbine controller internal systems.
A02 – Controller configuration error	The problem with downloading the configuration parameters, or no access to the data memory. Automatic entry into factory settings.
A03 – Clock signal error	Improper controller electronics operation. Incorrect clock signal detected.
A04	Unused information field.
A05 – Alpha angle control error	No reaction to attempt to change the position of nacelle, or an error reported by the inverter.
A06 – Beta angle control error	No reaction to attempt to change the angle of the blades, or an error reported by the inverter.
A07 – Brake control error	No information about turbine brakes unlocking or bad condition of the brakes.
A08 – Beta angle adjustment error	Information about setting the blade angle equal to or less than -1.5° , problems in communication with the inverter or malfunction of the measuring system.
A09	Unused information field.
A10 – Rotor speed measurement error	Faulty operation of one of the rotor speed sensors seen as lack of impulses or as interferences. Entry into an emergency stop procedure.
A11 – Maximum speed exceeded	Rotor maximum speed exceeded. Entry into an emergency stop procedure.
A12 – Safety systems error	Awaria zasilania układów automatyki.
A13 – Hub communication error	No communication with the measuring module placed in the nacelle.
A14 – Alpha inverter communication error	No communication with the nacelle yaw mechanism motor inverter.
A15 – Beta inverter communication error	No communication with the pitch control mechanism motor inverter.
A16 – Load controller communication error	No communication with the load controller (if it was installed). This failure does not affect the safety of power plant operation, but will stop the turbine.



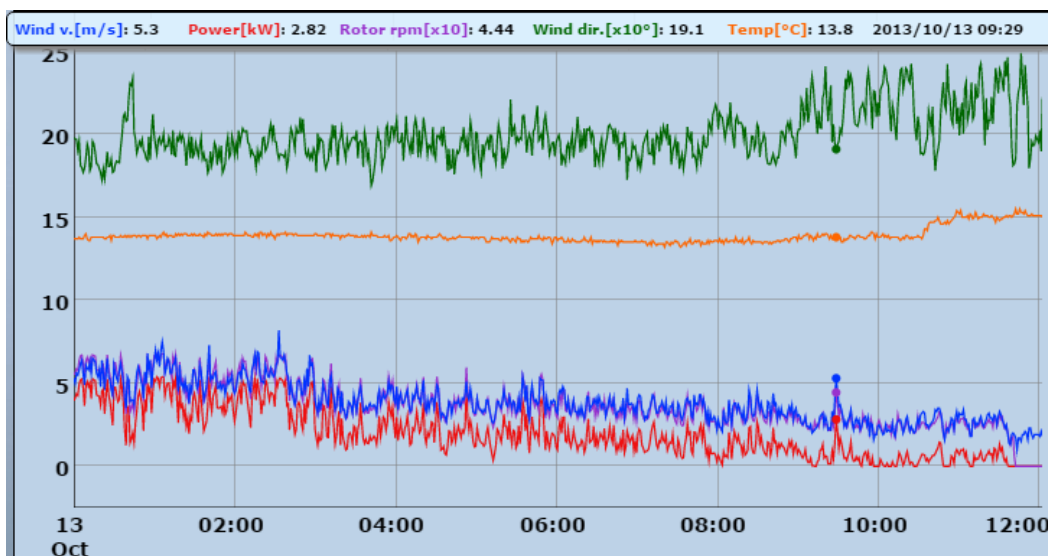
List of „Remarks“:

Displayed message	Description
U01 – Controller initialization	Wind turbine controller launch.
U02 – Low wind	Wind speed too low. Entry into a stop procedure.
U03 – High wind	Wind speed too high. Entry into a stop procedure.
U04 – Correcting nacelle position	Not optimal settings of the turbine rotor in relation to the wind direction. Start of the correction procedure.
U05 – Stop. Changing position	Stopping the rotor and the rotation of the turbine head to the optimal position in relation to the wind direction. The procedure starts with the sudden large changes in the wind direction.
U06 – No acceleration	No rotor rotation despite sufficient wind strength.
U07 – Reverse rotation	Incorrect rotor rotation direction detected.
U08 – Nacelle position limit	Achieving the maximum position of the nacelle in one of the rotation direction. Stopping the nacelle rotation.
U09 – Factory configuration	Controller operates with factory settings.
U10	Unused information field.
U11 – Beta angle control	Too fast rotor blades angle change detected, leading to turbine operation stop. Turning off the information after 5 minutes of continuous, correct operation of the blades angle sensor.
U12	Unused information field.
U13 – Hub initialization	Restart of the measurement module located in the nacelle.
U14	Unused information field.
U15 – Stop on demand	Turbine stopped by user.
U16 – Service stop	Turbine stopped in a service mode. It can be initiated locally or remotely by a service, or in case of repeated turbine operating problems, the system itself can automatically stop the power plant.



D) It is the largest section of the ZEFIR-SCADA panel. Immediately after logging, system displays graph of the power plant operating parameters and the weather conditions from the beginning of the day. It is updated on a regular basis. Refresh time of the displayed information is 5 minutes. After moving the mouse in the chart area or clicking on the desired location in the graph (for touch screen devices), above the graph will be displayed details for this "point in time":

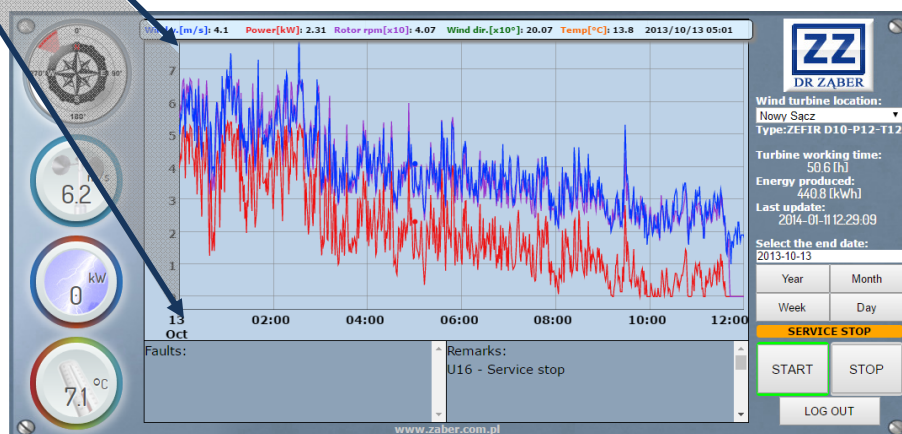
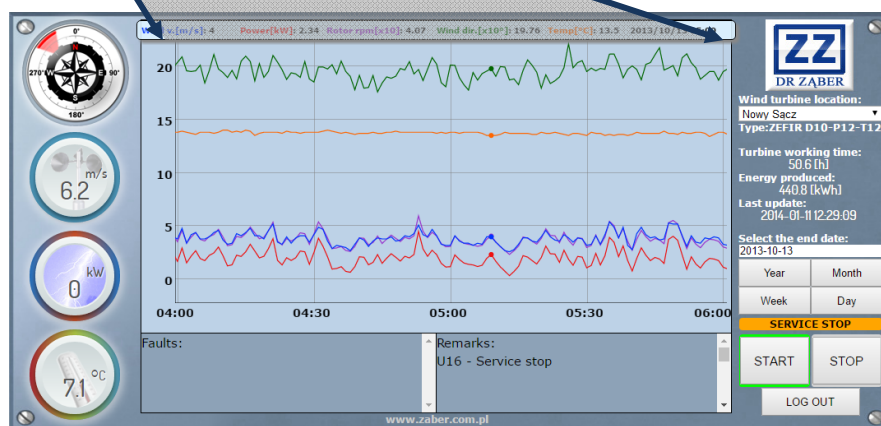
- wind speed (Wind v.[m/s]),
- power generated by turbine (Power [kW]),
- rotational speed of turbine rotor (Rotor rpm[x10]),
- wind direction (Wind dir.[x10°]),
- temperature (Temp[°C]),
- the date of recording the above parameters.



Graph of the section D has built-in an area scaling option in two axes, in order to better view of the selected time interval.

To enlarge the area of the graph, click the left mouse button at the desired point (located in the area of the chart) and without releasing the button, drag the mouse along one axis. Releasing the mouse button will enlarge the area of the graph in relation to the selected axis. An enlarged data area in the graph can be viewed before and after the pre-selected area. To do this, press and hold one of the ALT or SHIFT keys located on the computer keyboard, and then click anywhere in the graph with the left mouse button, and still holding it move the mouse along the selected axis. This functionality may be limited on the devices with a touch screen and its availability will depend on the software installed on the device (support for touch, web browser type, etc.)

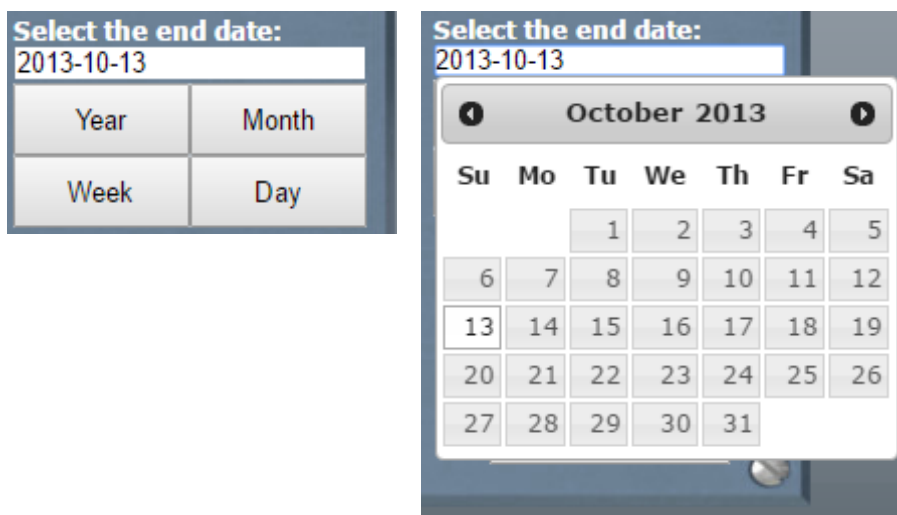




- E) This section is used to select the time interval from which the graph will display the historically recorded data. To start using this section, under "Select the end date" enter the last date of the desired range in the following format: YYYY-MM-DD (eg. 2013-10-13), or click the text input box and select it from the pop-up calendar . After filling the end-date field, click the button with the desired time interval range.

Depending on the selected button, the various interval ranges and different chart resolution will be displayed:

- Day: 24-hours interval range with 1-minute chart resolution.
- Week: 7-days interval range with 1-hour chart resolution,
- Month: 30-days interval range (28,29 or 31 depending on the number of days in a month), with 1-day chart resolution,
- Year: 365-days interval range (366 days for leap year), with 1-week chart resolution.



- F) This section is a control section. It contains three buttons: START, STOP and LOG OUT. Pressing the START button sends request to launch the power plant. If the controller will accept this task for realization, then the backlighting of the START button will turn green, and the backlighting of the STOP button will turn off. If you wish to stop the turbine, select the STOP button. If the controller will accept

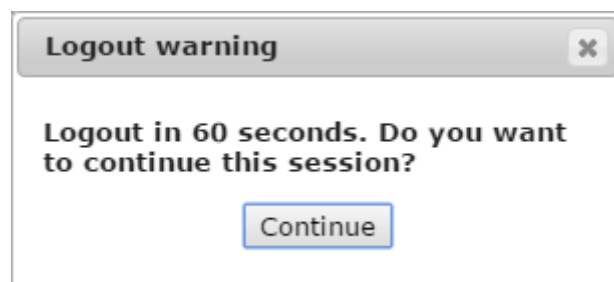


this task for realization, then the backlighting of the STOP button will turn red, and the backlighting of the START button will turn off.

Above the START / STOP button is a field which indicates the stopping of the power plant in service mode, called "SERVICE STOP". When there are no ongoing maintenance works, this field is highlighted in gray. If a person who is servicing the power plant will stop it locally or remotely, the "SERVICE STOP" field will be highlighted in orange. It should be noted that the signal informing about the service stoppage does not affect the START / STOP commands acceptance by the system. They are recorded on a regular basis, and their realization will take place only when the "SERVICE STOP" field cease to be highlighted in orange.



The last button of this section is a "LOG OUT" button. After using the ZEFIR-SCADA system, user is required to safely leave the control panel by pressing this button. If the operator forgets to log out, when system detects 15-minute period of inactivity it will display the information about the automatic log out. If user doesn't confirm the desire to remain logged in by pressing the "Extend Session" button, then the system automatically logs out after another 60 seconds.



13. Manufacturer contact information:

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