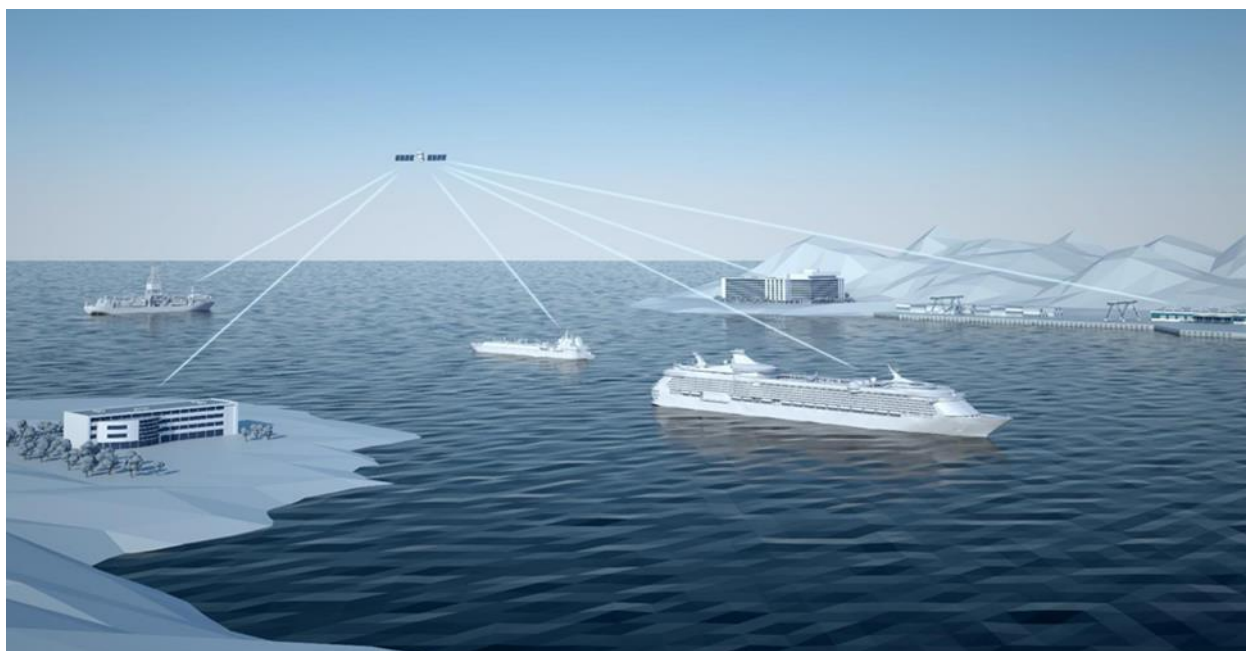


MANUAL

ABB Ability™ Marine Remote Diagnostic System

Operator Manual



APPROVED
2022-01-25

STATUS	SECURITY LEVEL	DOCUMENT ID.	REV.	LANG.	PAGE
Approved	Public	8MAL100003-0004	D	en	1/48

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Revisions

Revision id.	Description
A	First release
B	General review
C	General review
D	Headers, footers

1. General information

1.1. Introduction

This is the operator manual for ABB Ability™ Marine Remote Diagnostic System.

ABB's remote diagnostic system provides system monitoring and expert services to ABB's customers. This is done through a single point of communication from ABB's 24/7 support center covering the entire ABB scope of supply.

1.2. Related documents

Ref #	Document Kind, Title	Document Id.
1	ABB Ability™ Marine RDS - Function Description	8MAL100003-0072
2	ABB Ability™ Marine RDS - Commissioning Report	8MAL100003-0073
3	ABB Ability™ Marine RDS - Cyber Security Description	8MAL100003-0074

1.3. Acronyms

Acronym	Description
CB	Circuit Breaker
MV	Medium Voltage
NextNine	ABB application installed on RDS where ship IT personnel has full control of remote activities.
RAP	Remote Access Platform - overall solution that ABB utilizes to make a secure remote connection between ABB's Service Center and the RDS system on the vessel.
RDS	ABB Ability™ Marine Remote Diagnostic System
VSE	Virtual Service Engineer - a software component that is installed on the RDS to enable secure remote connections.

2. RDS Overview

ABB Ability™ Marine Remote Diagnostic System provides system monitoring and expert services to our customers. This is done through a single point of communication from our 24/7 support center covering the entire ABB scope of supply. RDS system installed onboard the vessel records critical signals from controllers, drive units, sensors and gives ABB experts full access to real-time and historical data. In result, process of fault-finding and troubleshooting is greatly reduced.

2.1. RDS is a read-only system

To ensure that all RDS work is performed within the marine rules and regulation, a strict setup for remote access platform is used. Under no circumstances is it possible to perform changes over the remote connection either in parameter settings or software configuration, without the customer knowing.

The onboard RDS application has only monitoring rights and possibilities to the propulsion control system.

2.2. RDS data collection

RDS onboard collects data from the automation and control systems, frequency converters, switchboards and condition monitoring units. More details are given in the RDS Function Description [1].

Data recorded onboard the vessel by the RDS computer(s) is transferred to the ABB Ability™ Collaborative Operations Center (COC) based on an adjustable schedule, typically every 10 minutes (configurable).



Automatic file transfer is active for both Preventive Light and Preventive Service Levels.

2.3. ABB Ability™ Collaborative Operations Center

The main purpose of the Collaborative Operations Centers (COCs) is to resolve customers' problems without delay. The RDS concept achieves this by directing the manufacturer's unique competence to the problem without incurring the cost and delay of an on-board visit.

The RDS onboard installation gives the customer easy access to the ABB engineers on duty at the COCs via a secure encrypted communication solution using the Internet via a satellite link. This near-instantaneous connection brings up-to-date measurement data into view on shore and allows ABB technicians to assess the situation and give immediate guidance.

3. System roles and user accounts

The RDS system has three user accounts:

- Operator
- ABBAAdmin
- LocalAdmin

The Operator user account is intended for ship's crew. The main idea is to display final information about the state of monitored components, allow for initial data analysis by looking at the trends of selected signals, and analyze the history of alarms and events.



At first login to the Operator user account, the password must be changed by user (customer). ABB does not know the password for this account.

The ABBAAdmin and LocalAdmin user accounts are supposed to be used by IT qualified personnel that have a wide or complete access to all information and configuration option available in the RDS system. These two user accounts are described in document ABB Ability™ Marine RDS - Cyber Security Description (8MAL100003-0006).



Login credentials for ABBAAdmin and LocalAdmin accounts are handed over to customer as a KeePass password database after commissioning of the RDS system. ABB keeps a copy of the passwords.

4. Basic operator user interface

The operator interface contains the following main panels:

- Alarms
- Signals & Trends
- Option: Status

Each provides diagnostic information and is described in details further in this document. To start the new RDS4Marine user interface, click the Desktop shortcut or select **Start > RDS > RDS UI**.



Figure 1 - Desktop shortcut symbol

The default main screen has all the panels visible.



Figure 2 - RDS4Marine operator user interface

Legend	Description
1	Status panel area, where overall information about objects are displayed (Option).
2	Alarms panel lists most recent events merged from monitored objects. An event can have data loggers matched with it. Data loggers for the event are visible in Data Loggers tab.
3	Signals & Trends panel enables you to select signals and display them on the chart.
4	Status, Alarms, Signals and Trends buttons are used to turning on/off the specific panel. You can display all of the panels at the same time or can turn on only required panels.

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Legend	Description
5	Global date and objects filters are used to filter alarms and signals.
6	Data export button is used for configuration and execution of data export.

4.1. Alarms panel

The Alarms panel shows all alarms that are stored in the RDS system. An alarm is described by a message, information about the object the event originated from and the time stamp.

It is possible to show a detailed description for the event with some hints for rectification and possible causes if defined. To display the detailed description click on the '+' icon next to the object name.

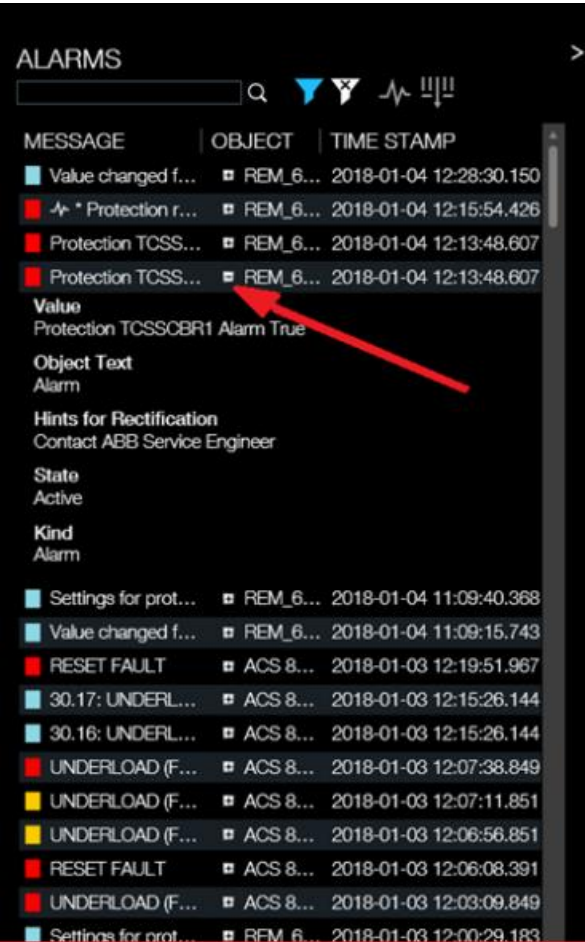


Figure 3 - Alarms panel

Filtering of alarms and events can be done using the local filter (works only for alarms view) located in the top of the alarms panel (1) and with global filter (2) (works both for alarms and signals & trend).



Figure 4 - Filters for alarms and events

The following methods can be used to filter alarms.

4.1.1. Using Objects filter

To filter alarms based on objects they belong to (for example, LV Drive ACS 800), select an alarm from the dropdown list located in the global filters.



Figure 5 - Objects filter

4.1.2. Using Time filter

Click on one of the following time filters to filter alarms and signals that are at most,

- 1d – one-day old
- 1m – one-month old
- 6m – six-months old
- 1y – one-year old



Figure 6 - Time filter

4.1.3. Using KIND filter

To filter only the events for the chosen kind, select the required kind options.

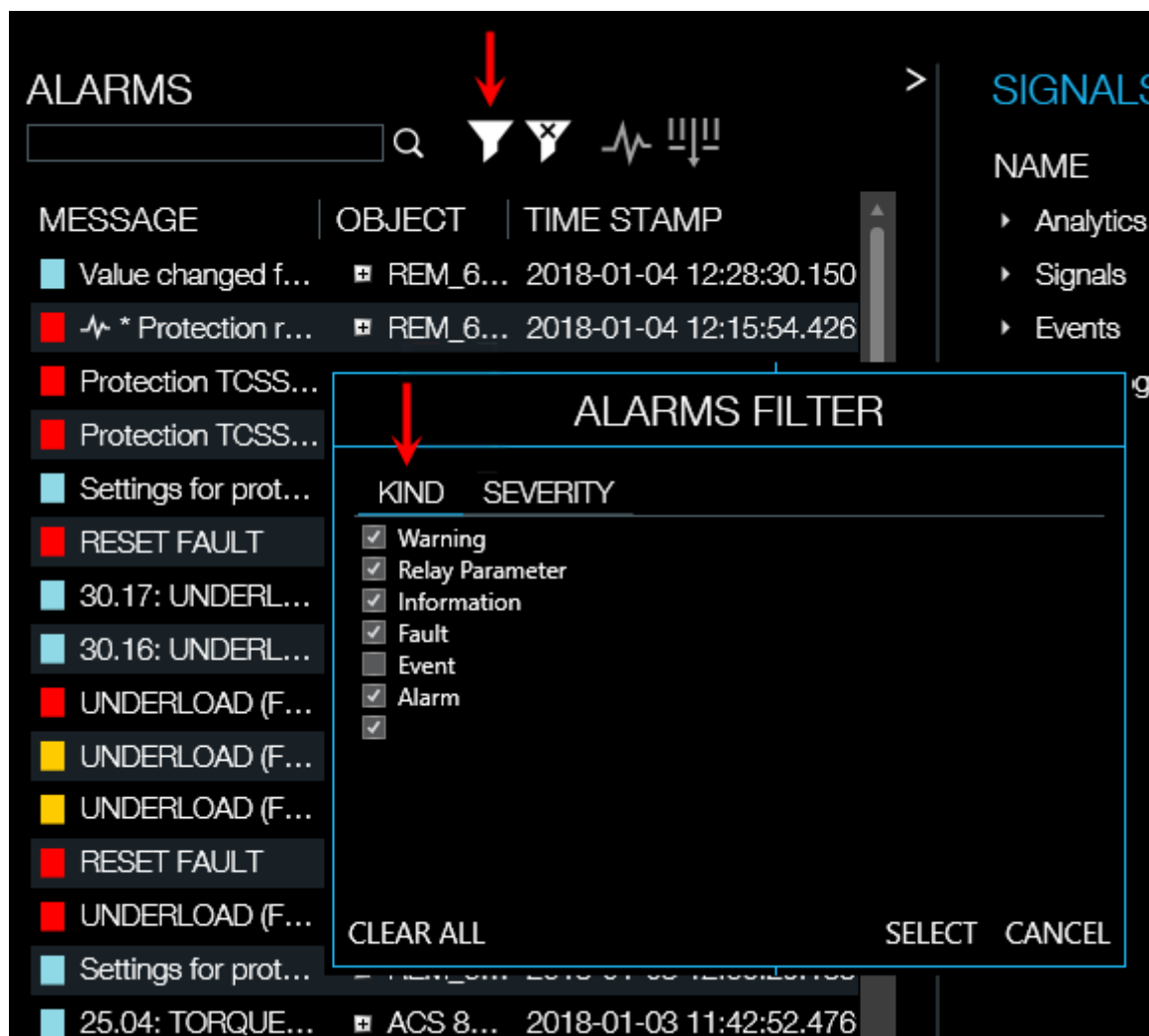


Figure 7 - KIND filter

4.1.4. Using SEVERITY filter

To filter only the alarms for the chosen severity, select the required severity options.

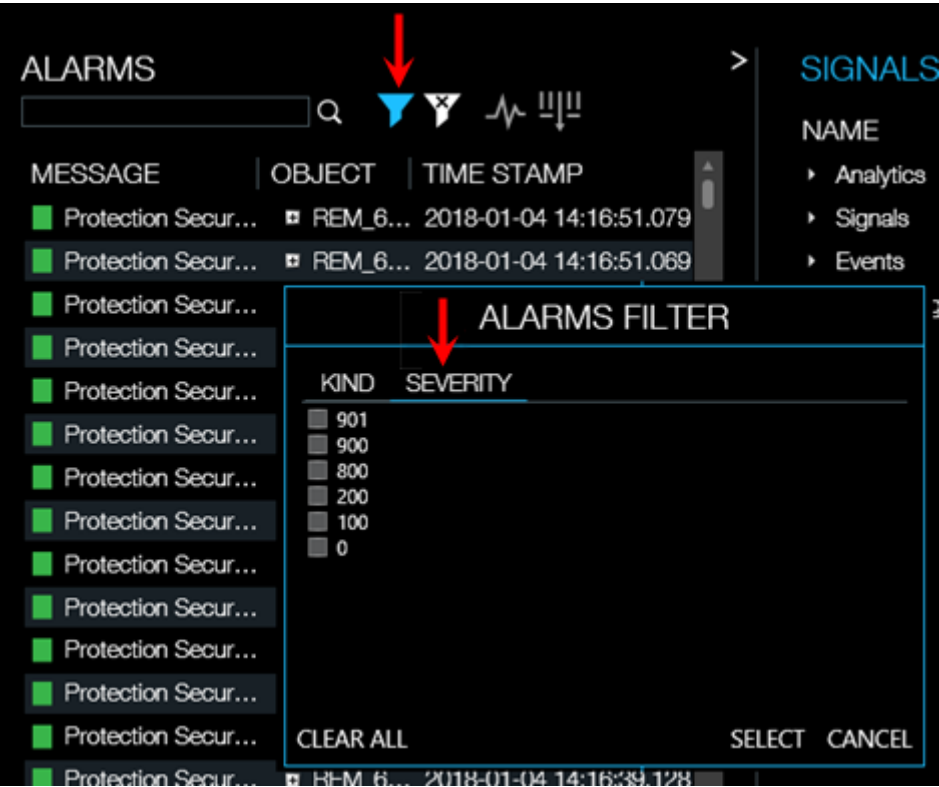


Figure 8 - SEVERITY filter

4.1.5. Using Text filter

To find the alarms with the message matching an expression, type the expression in the find text box.



Figure 9 - Text filter

From the related alarms:


1. Select one of the alarms.
2. Click .
3. A list of all related messages appears.



Figure 10 - Messages related to the filtered alarm

4.1.6. Clearing filters

To clear global filter options, click .

4.2. Signals and trends panel

The Signals panel displays the trends of selected signals for the chosen objects. The main functional areas are shown in the following figure.

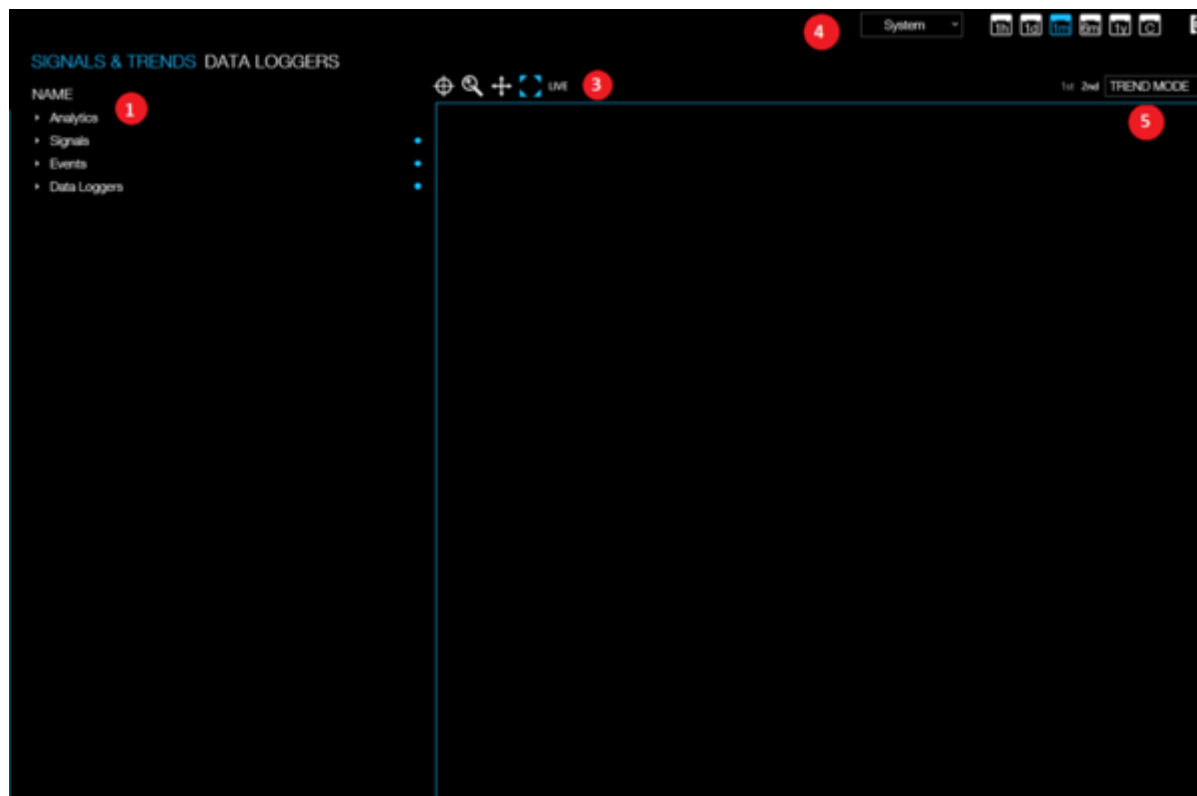


Figure 11 - Functional areas of SIGNALS & TRENDS panel

Legend	Description
1	Signals tree containing a hierarchy of all signal variables. To expand the single node up to the variable level, click on the small triangle next to the node name.
2	Plot area is where trends are plotted. To select/deselect signals to be drawn, right-click on any node and then choose select/deselect from context menu. On the lowest level of tree (nodes are then signal variables) also double-click can be used to select/deselect a signal.
3	Plotting tools are used to zoom and adjust the trend.
4	Global date and objects filters are used to filter alarms and signals.
5	Plot number selection and Plot mode are used to select a number of the plot (1st or 2nd) and correspondingly select the trend mode or plot mode to view the signals and trends.

A blue dot appears next to the signal name which indicates data availability within specified time filter.

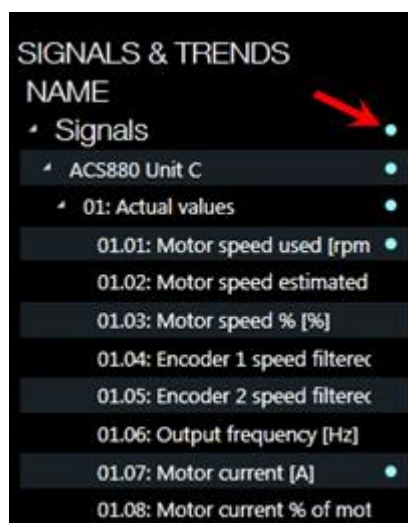


Figure 12 - Blue dot for signal names

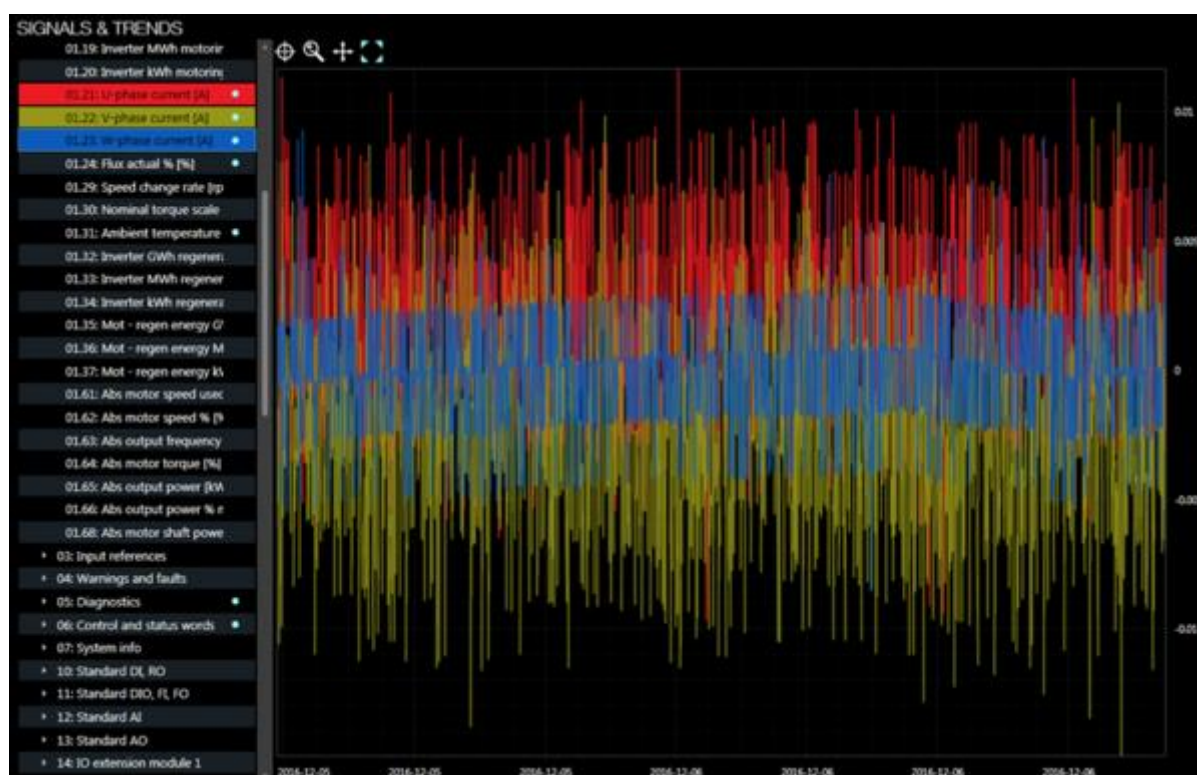


Figure 13 - Plotting area

Above the plotting area there is a panel with the available tools.



Figure 14 - Tools panel

Blue color is used to indicate the active tool. The first one – cursor can be selected or deselected at any time. The three others – zoom, pan and auto scale - can be chosen only one at the same time.

4.2.1. Using the cursor tool


Click  to show the cursor with a tooltip. When you move the cursor on the plot area, the variable name and the OPC value are displayed in the tooltip. Also the corresponding values are being displayed on the axes.



Figure 15 - Cursor with tooltip values

4.2.2. Using the zoom tool



Click  to zoom in. Then left-click and hold plot area which you want to zoom. You can also zoom in and out with the mouse wheel. To reset the plot to default view, double-click on the plot area.



Figure 16 - Zoom in and out of plot area

4.2.3. Using the pan tool

Click . Then click on the plot area and drag to move the visible surface.

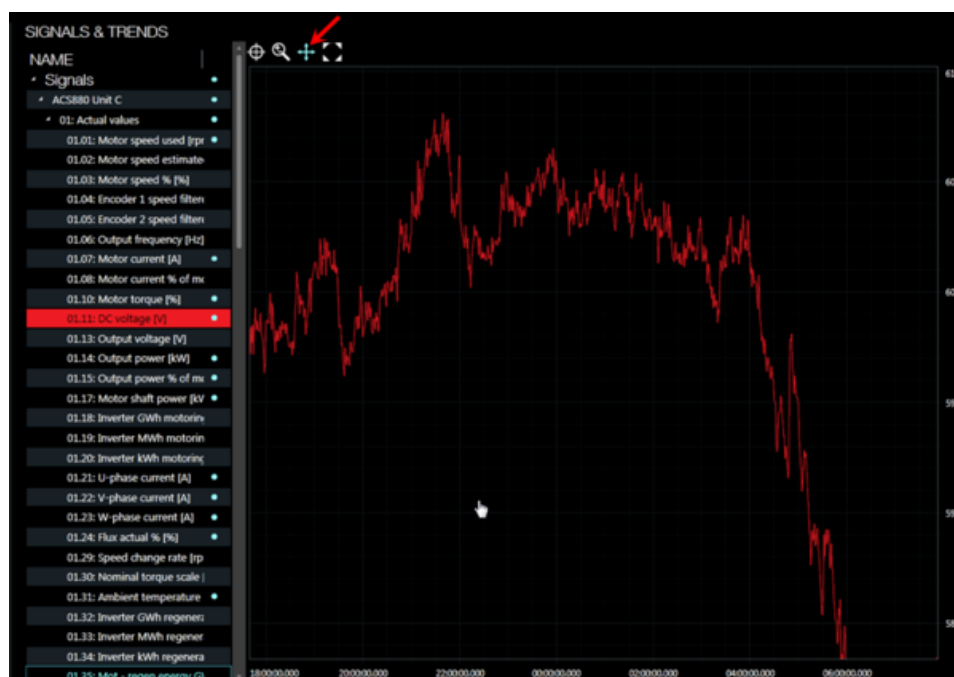



Figure 17 - Panning the plot area

4.2.4. Using the auto scale tool

Click  to auto scale the plot area and reset the zoom in/out.

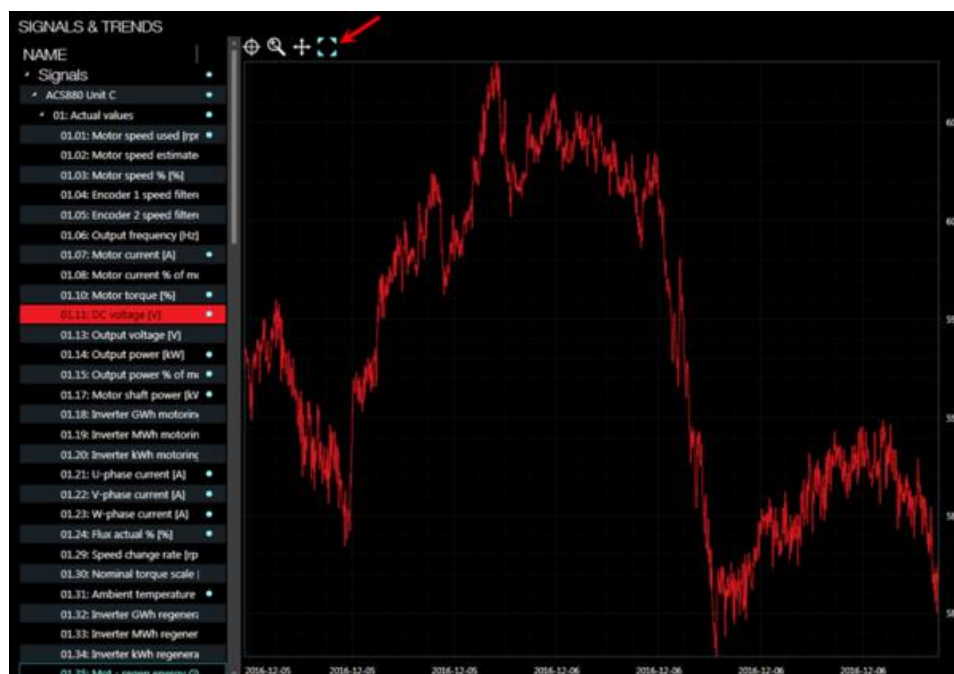



Figure 18 - Auto scale the plot area

4.3. Alarms with Data Loggers

Data Loggers tab displays data from faults (before and after a fault). It shows Data Loggers that have a stamp from 3 seconds before to 30 seconds after the alarm has occurred.

Following are the steps to display Data Loggers for the event on chart:

- 1. Select one of the alarms.
- 2. Click  (the button is greyed out if an alarm does not have any data logger).
- 3. Data loggers for the event appear in the **Data Loggers** tab.

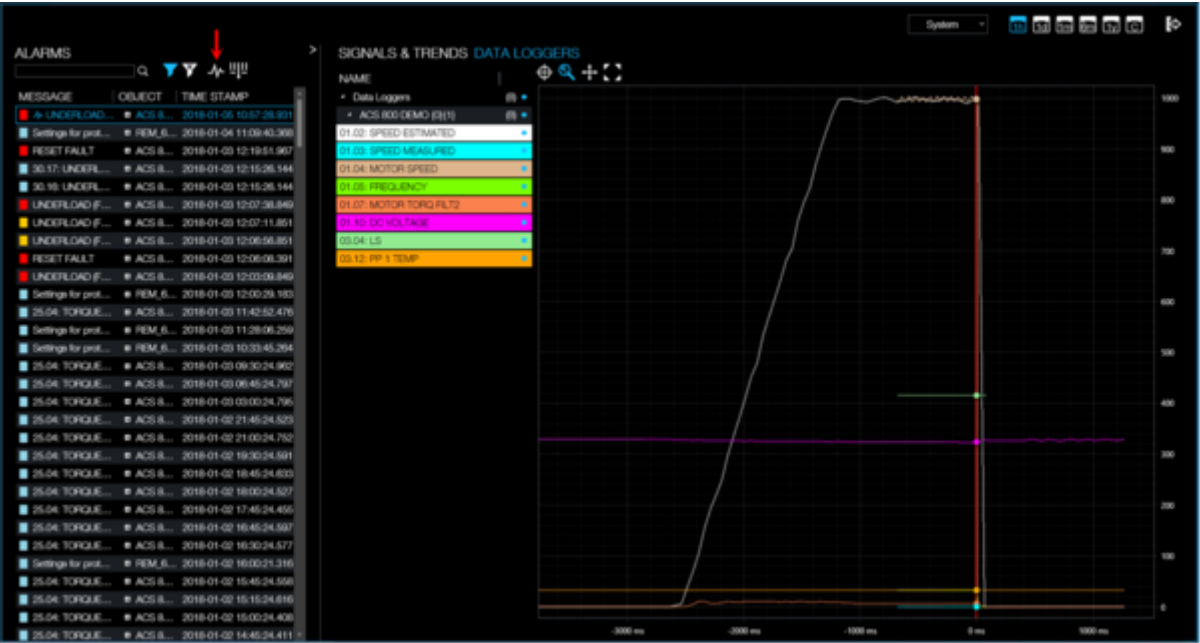



Figure 19 - Data Loggers for the event

4.4. Data export

Click  to perform data export. Values for all objects and variables defined in the .dmc file can be exported.

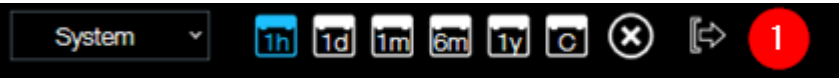


Figure 20 - Data export tool



Figure 21 - Three different selections which determine values to export

Legend	Description
1	Objects selection - all objects or selected objects
2	Locations selection – all locations or data form selected locations.
3	Time range selection – all data or data from selected time range. It is possible to use filters such as: one hour, one day, one month, six months or one year.

Data exported are saved into .cmx format file.

4.5. Option: Status panel

The Status panel is offered as a custom-built option and is part of RDS Level 3.

On the top of the Status panel, **ASSET TYPE** and **SYSTEM** group buttons are provided. Each represents a single top level group.

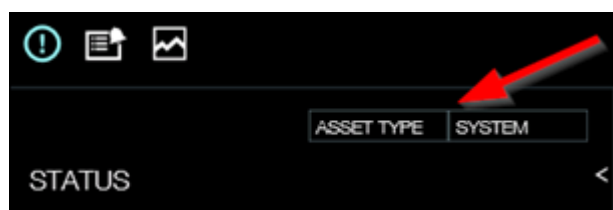


Figure 22 - Status panel

To expand the top level group click on a group button, as a result a group collection (ASSET TYPE (1), SYSTEM (2)) with three traffic lights appears. The traffic lights - ANALYTICS, Equipment Status and RDS System Status, describe the status of each subsystem. The color of the traffic light represents the state

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of the objects (devices). If one of the traffic lights is red or yellow it means that in one of the objects an error or warning has occurred.

Asset type (1) contains groups associated with object types.

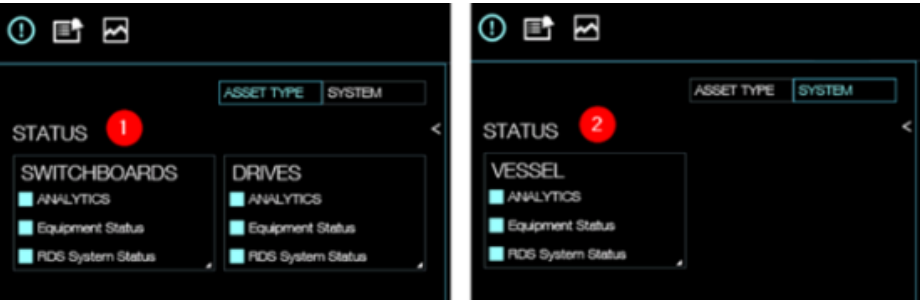


Figure 23 - Asset Type and System groups

To expand the list of objects contained in a group, click on the group label (for example, DRIVES). A list of objects appears.

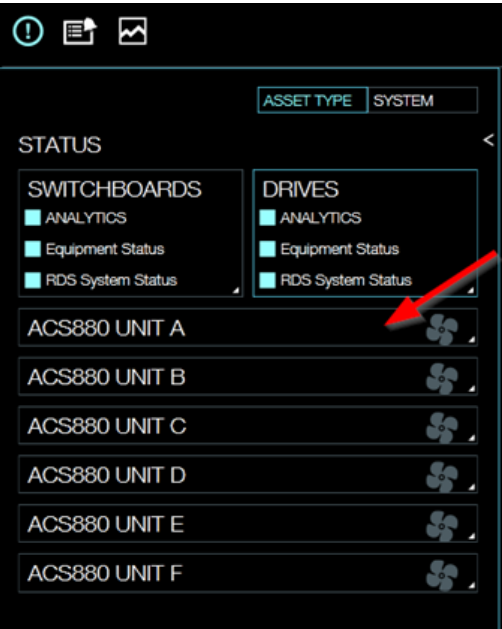


Figure 24 - List of objects of DRIVES

Details of an object consist of predefined parameters that correspond to the status of the device. The list of parameters can be different for each object.

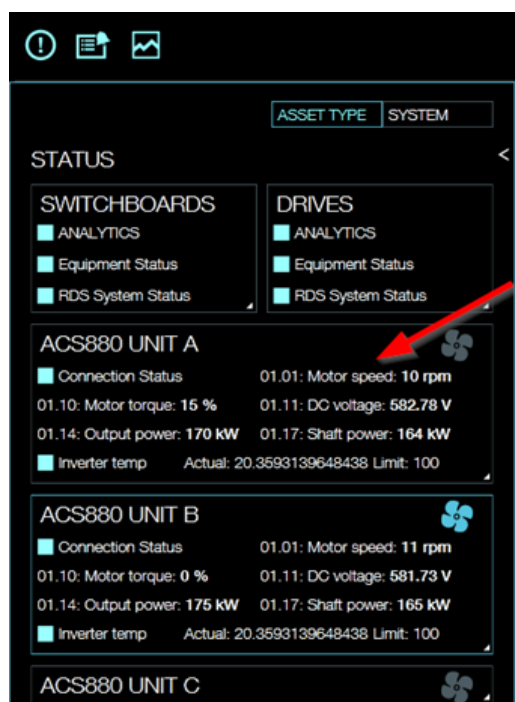


Figure 25 - List of parameters of an object

SWITCHBOARDS is a specific type where there is a possibility to have subgroups defined inside. for example, MSBD1, MSBD2, CSBD1 and CSBD2. Each subgroup corresponds to a subtype of switchboards.

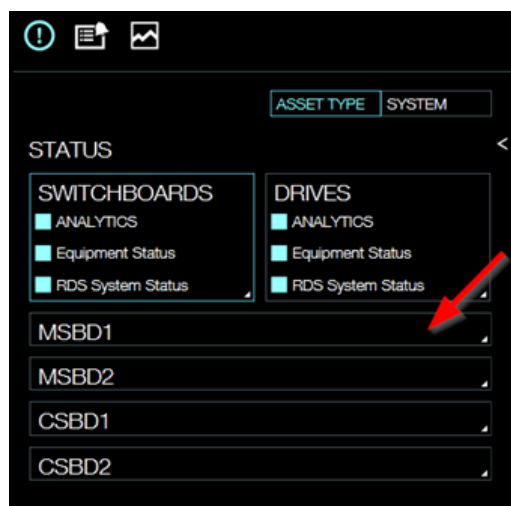


Figure 26 - Subgroups of SWITCHBOARDS

To see all the objects in a subgroup, click on the subgroup label.

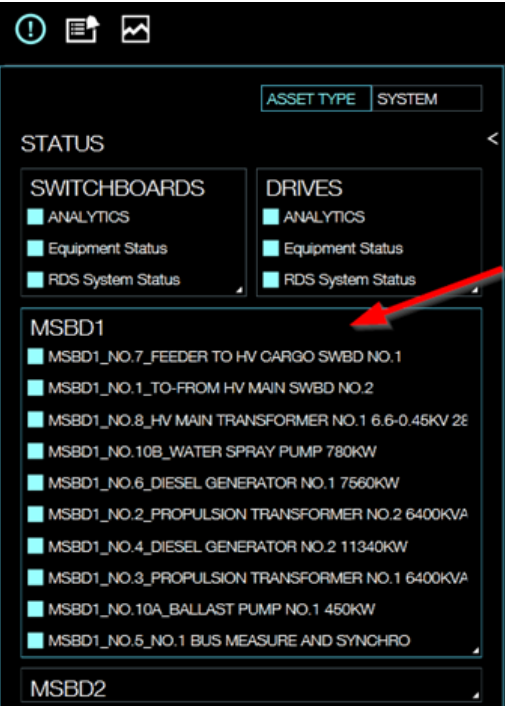


Figure 27 - List of objects in a subgroup

To see the details, click on the object.



Figure 4.8: Details of an object

5. Advanced operator user interface

The RDS computer intended for Operator use is typically located in the engine control room. The main functions of the Operator workplace are:

- To display the diagnostic information about all propulsion modules, relays, machines and all other equipment that are to be monitored according to project RDS requirement specification.
- To interface the RDS software with several main views: Events, Loggers, Signals, Monitor and Data described in details later in this document.
- To navigate between views and panels.

Open the advanced UI by clicking the Desktop shortcut or select **Start > RDS > RDS**.



Figure 28 - Desktop shortcut symbol

The system initialization may take up to a minute, since during the start-up, data from all the monitored devices are loaded from disk.

5.1. Events view

The following figure illustrates the initial view when the Operator has launched the RDS system.

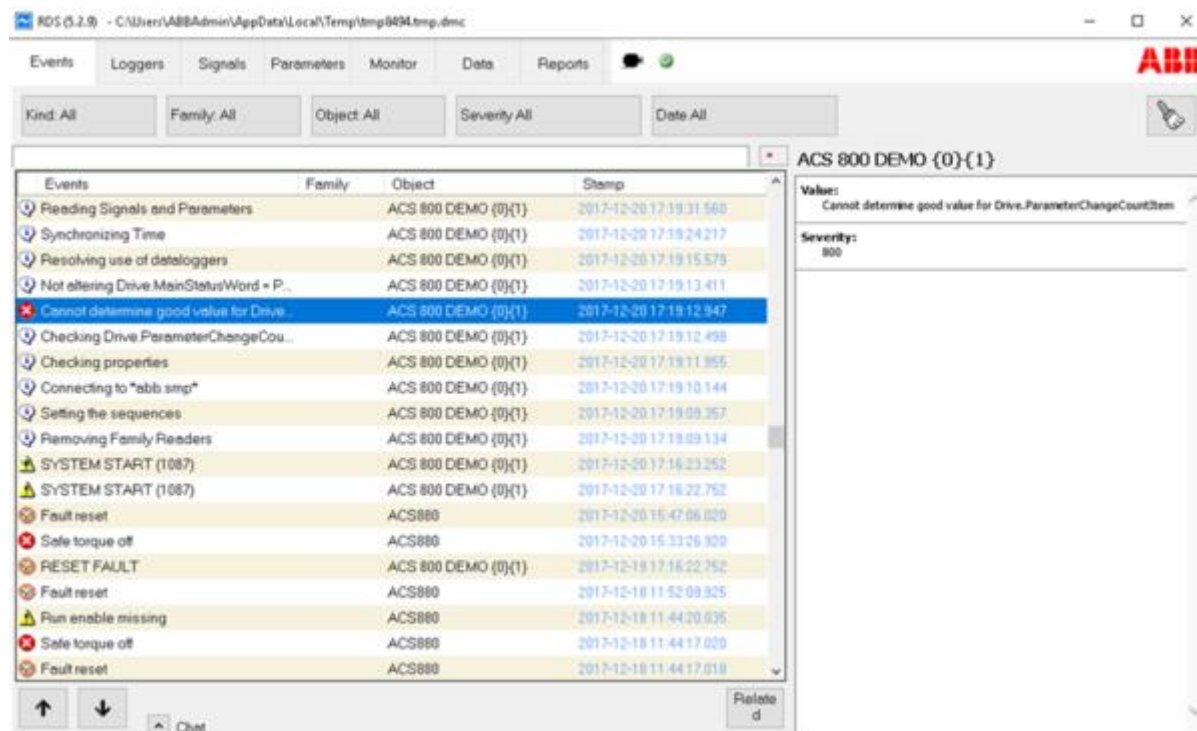


Figure 29 - Operator's workplace – Events view

The functionalities of the Events view's main areas are described in the list below:

- Events list which shows all alarms that are stored in RDS system. This would include alarms generated by subcomponents (drive, controller, relays, and machines).
- Detailed description of the fault/alarm/event with some hints for rectification and possible cause's descriptions if defined.
- Tab to switch between Events view and Signals view.
- Filtering of "Event and Alarm List" by:
 - Object (PORT/STBD)
 - Date
 - Severity
 - Type
 - Family

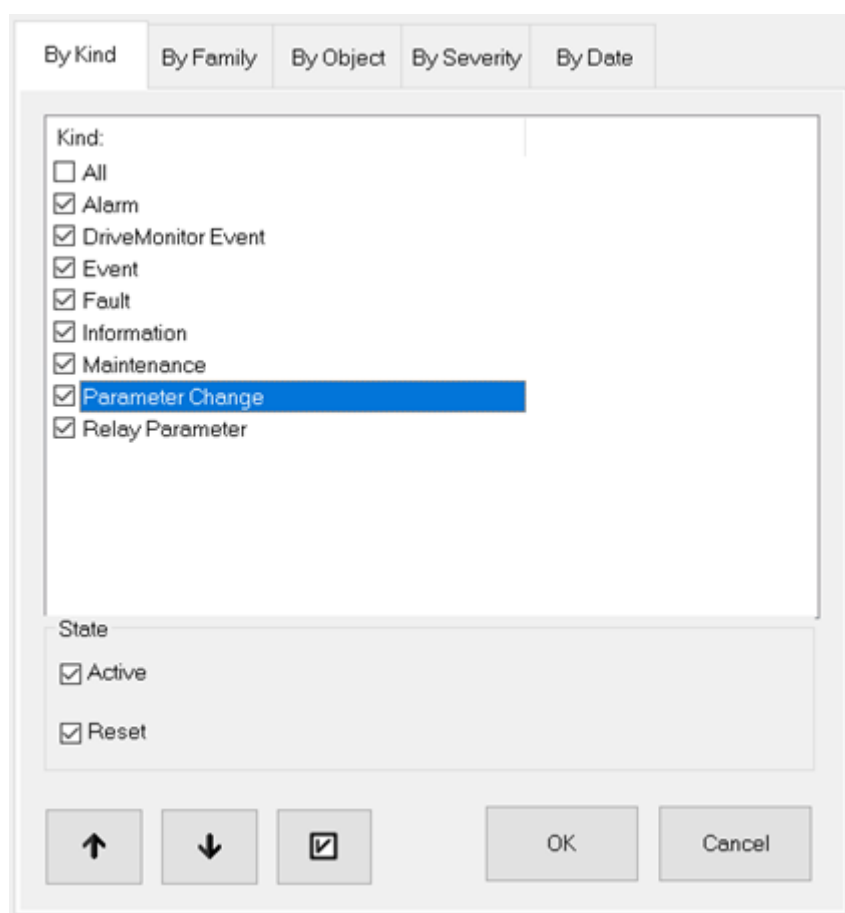


Figure 30 - Different filtering categories

With the Brush button (located on the right side of the screen), it is possible to reset all the filtering options to the default values.

It is possible to shorten and filter the Alarm list:

- According to object, port or starboard
- According by Date/Time

5.2. Loggers view

In case of a fault, alarm or warning from the frequency converter or relay, there is a prefix sign “*” (star) in front of the event name. There is also an additional Loggers tab, where data loggers from the drive or relay related to this particular fault are available.

Loggers view has some navigational features that are exactly the same as the Signals view (described in the next chapter). There are a few options worth mentioning at that time:

- After selecting a particular fault from the Events list and then switching to the Loggers view, it is possible to view this fault in a form of vertical, green line. Moving the mouse pointer over the line displays a hint with the name of the fault.
- There is an icon that allows exporting all the loggers as ASCII data in a text file. It is just required to name the file with its location where the data loggers are to be saved. This functionality is particularly useful in case ABB service does not have remote access to the system, and operational data (in this case, the drive loggers) is to be sent to the onshore organization.
- Point with the mouse over the green, vertical line in the grey area, where the line coordinates are displayed and then drag the mouse to left and right – observe that on the left side variable list, the values next to the variable name are changing according to the white ‘stamp line’ movement. It is possible to also use the arrow buttons to shift the horizontal, white stamp line.

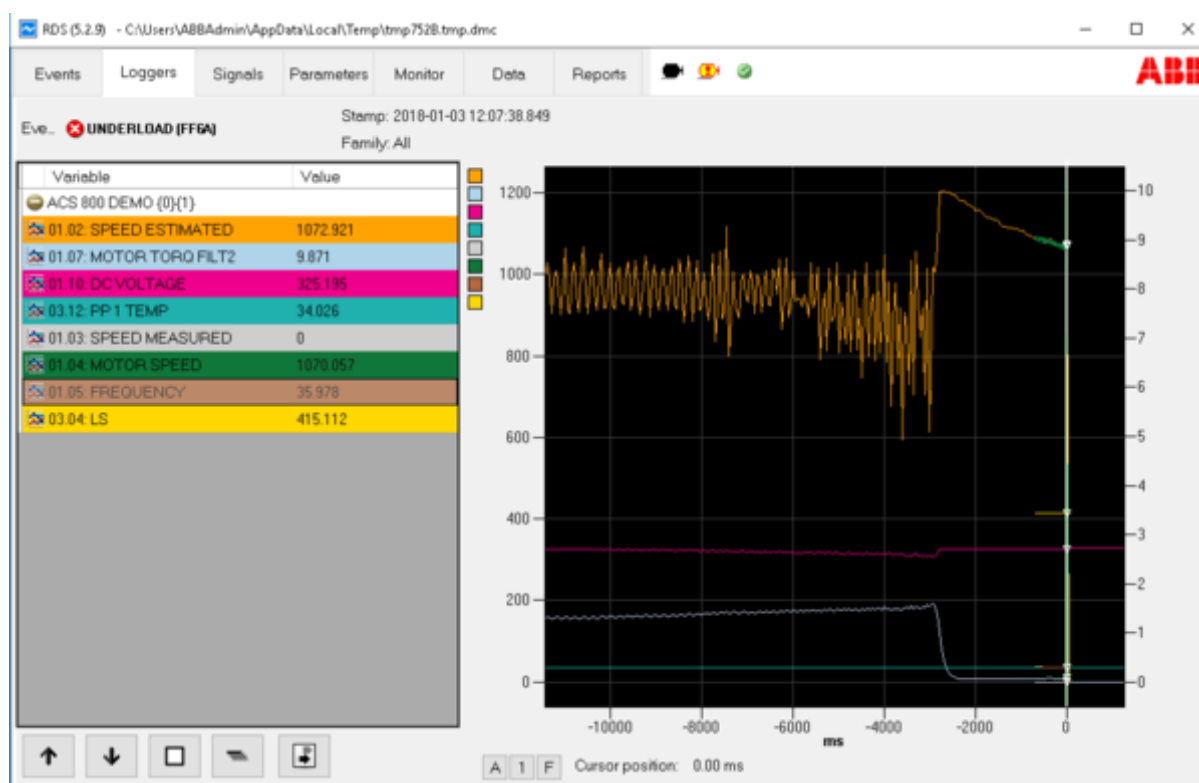


Figure 31 - Transient recorders from the protection relay

5.3. Signals view

The signals view shows the trends of the selected signals correlated to the object which is the owner of selected event from the EventList (marked with number 5 in the following figure). The main functional areas of the Signals view are illustrated in the following figure.

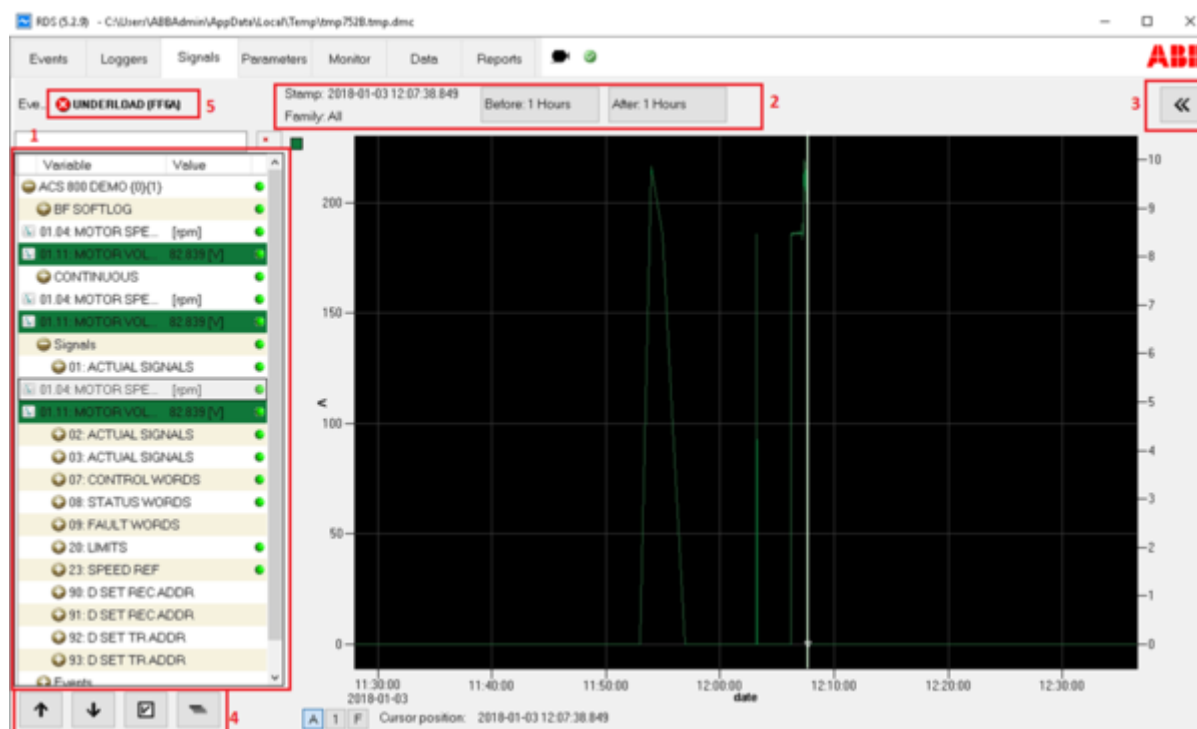


Figure 32 - Operator's workplace – Signals view

The main functional areas of the Signals view are:

- Variable list that is always constant and limited to certain signals for the operator user. The signals are organized into a tree and that can be expanded easily by double-clicking them or by using the buttons below the list.
- Shows the time stamp of the green vertical line (marked with red arrow in figure above) that is the reference for the time scale shown on X axis. With buttons: Before and After it can be defined the time range in relation to the green line.
- After selecting an event in the Event List and switching to the Signals tab, the time stamp of this particular event is used as a time reference for the signals displayed on the trend. To erase these settings and let the user to provide his/her own time scale, it is required to first click the button marked as field (3) in Figure 17.
- Buttons marked as (4) in are used to navigated the variable list between the signals, to select the signals to display, and to expand and to collapse the variable tree.

To set the reference date, click the **Date** button marked with (1) in the following figure. The time selector window appears.

- With button (2) in figure below it can be set the current date, and with button (3) the current time
- To specify the required date and time, first click on a field from Date and time rows and then use the numerical keyboard (4). To apply the changes, click OK
- To define the time range before and after the time reference, use the buttons from field (5).
- After clicking one of those buttons, click the Hours button to switch between time units
- Finally, click button (6) and type the required number using the numerical keyboard

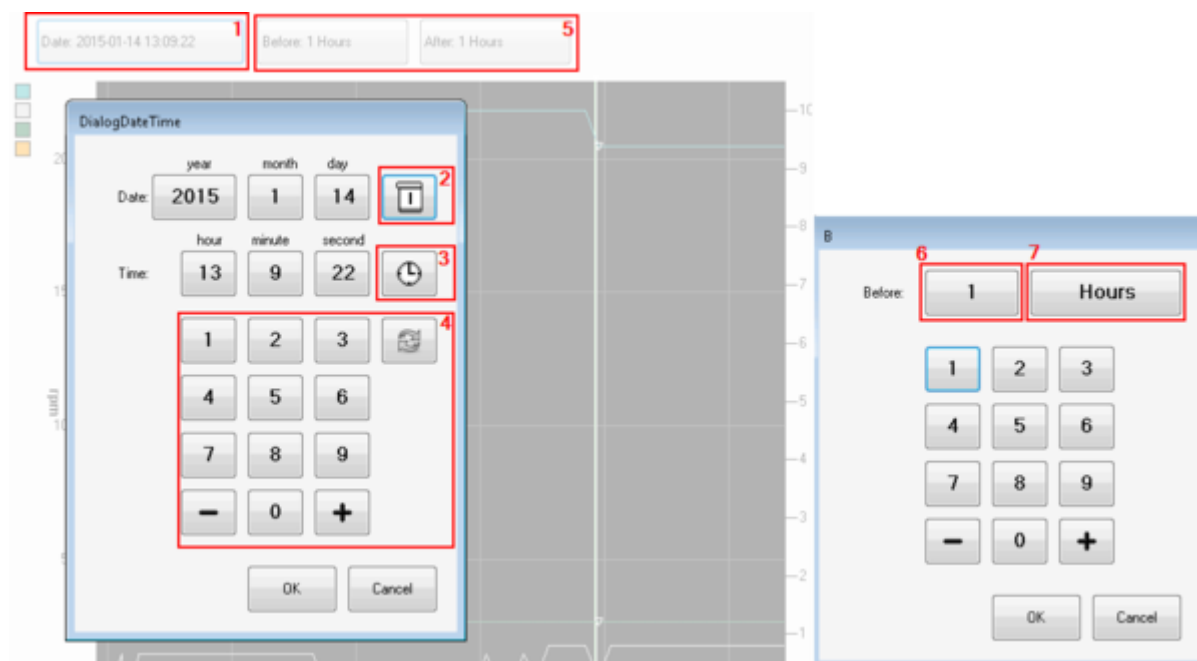


Figure 33 - Date selector



For normalization, the minimum and maximum values for the current time range selection are taken. Range 0-100% does not take into account the real minimum and maximum values of a particular signal e.g. 0-150 rpm for rotation speed set in the drive.

5.3.1. Multi-axis management

It is possible to change the type and the label as well as define on which side a signal should be visible.

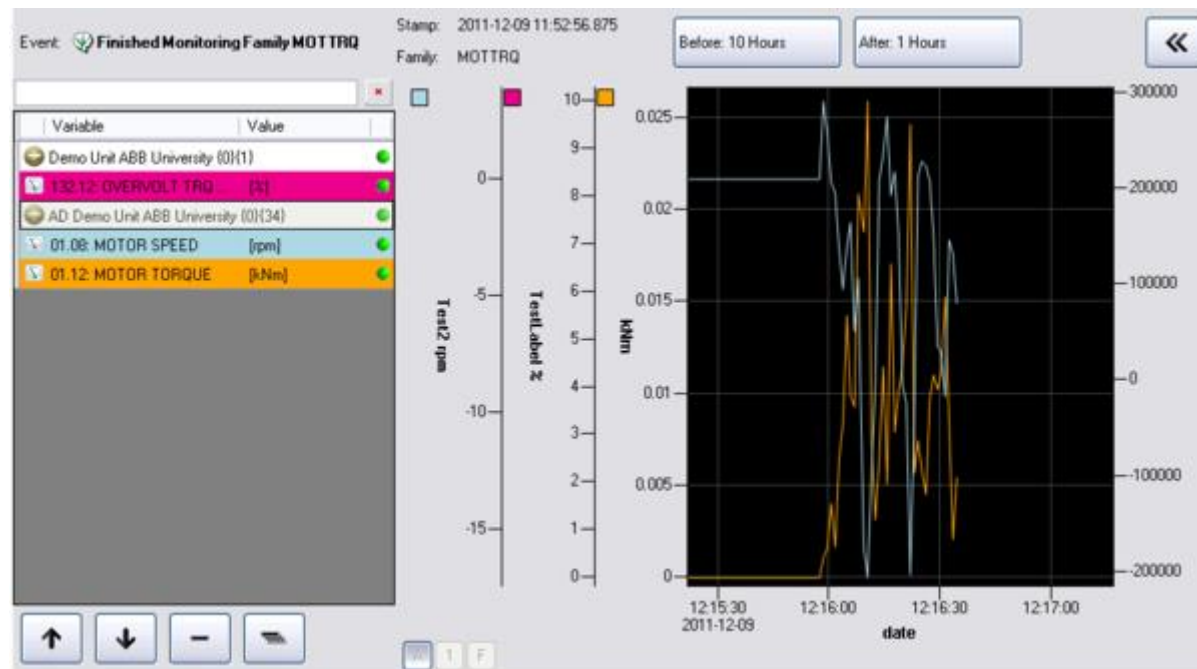


Figure 34 – Multi-axis example

Every axis can be modified by grabbing its scale and moving up or down.

5.3.2. Data plot scaling

Three scaling buttons are located at the bottom of the screen.



Figure 35 - Scaling buttons

Each button activates a different scaling option:

-  Auto scaling – RDS system scales graphs to fit them all on the screen:

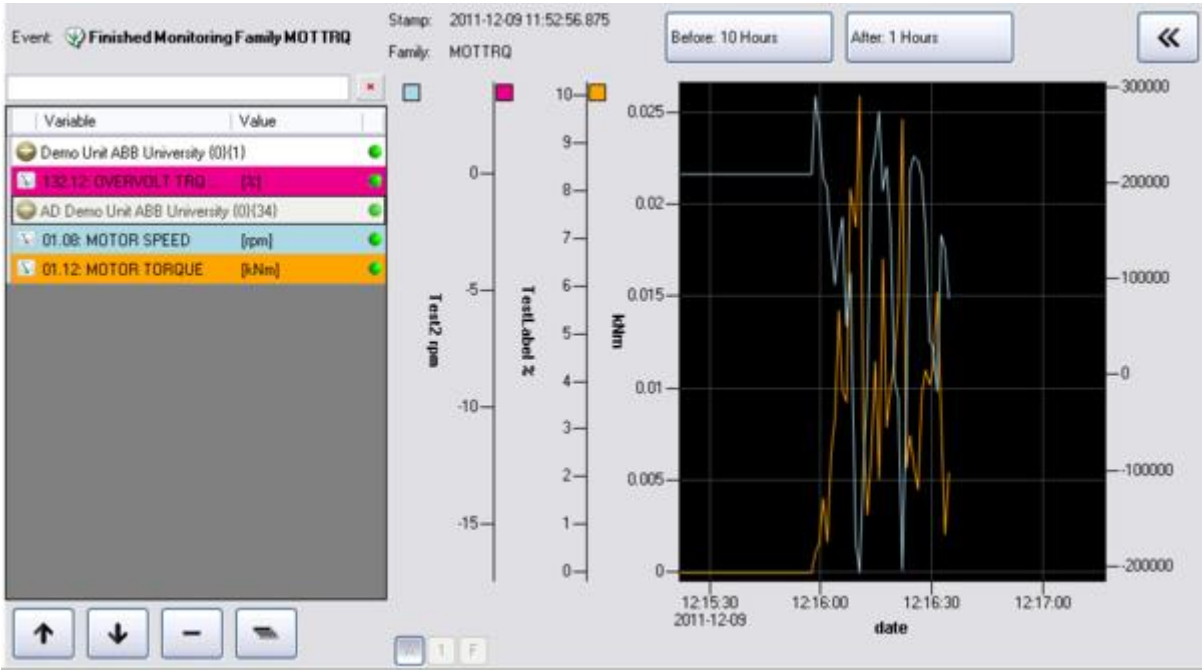



Figure 36 - Auto scaling option

-  Fit to first signal – Y Axis is scaled to fit the first selected signal:

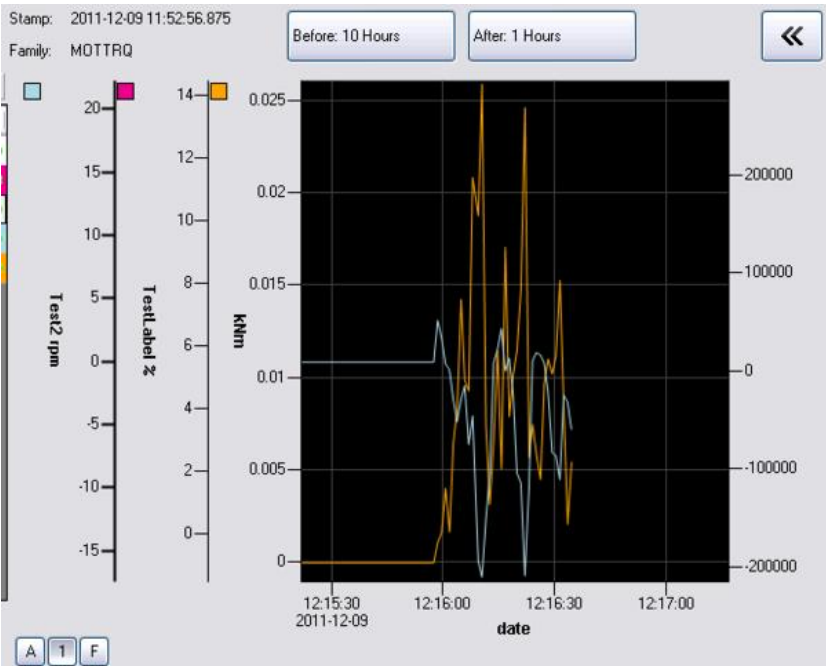


Figure 37 - Fit to screen height option

- **F** User defined maximum and minimum of Y Axis:

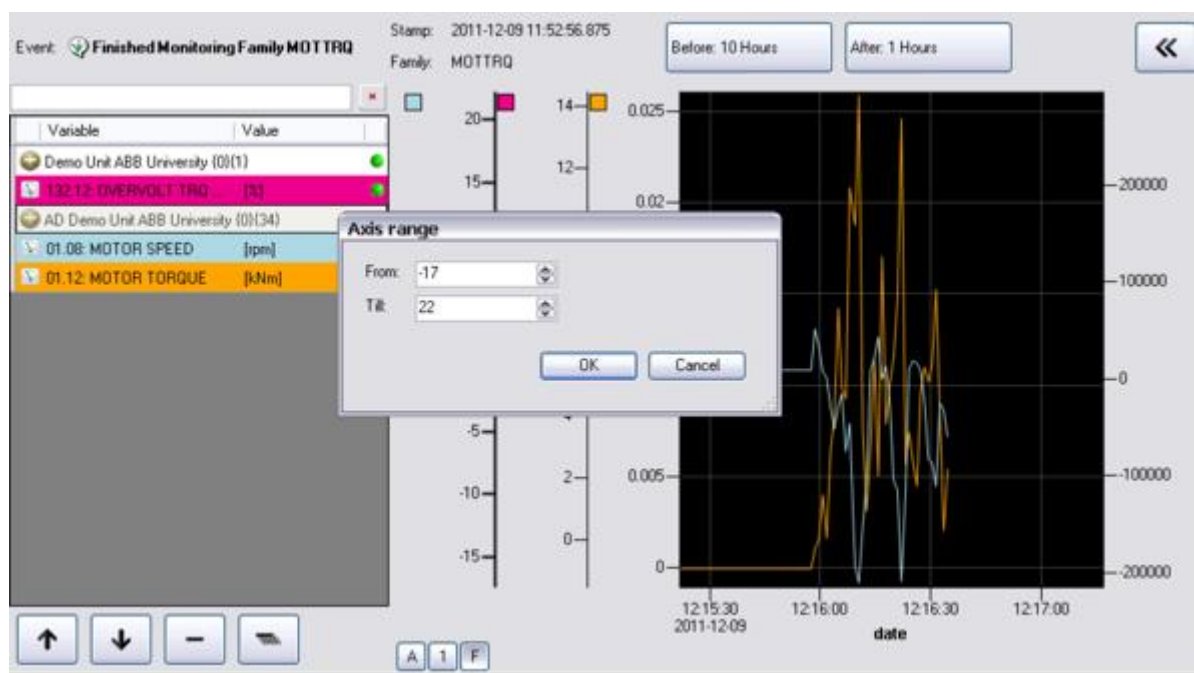


Figure 38 - User-defined limits



With every scaling option, you can refresh the plot area with the selected scaling option settings by double-clicking the plot.

5.3.3. Zooming

To zoom in:

1. Left-click and hold any place on the plot area.
2. Drag the mouse to enlarge the selection box.
3. Release the left mouse button.

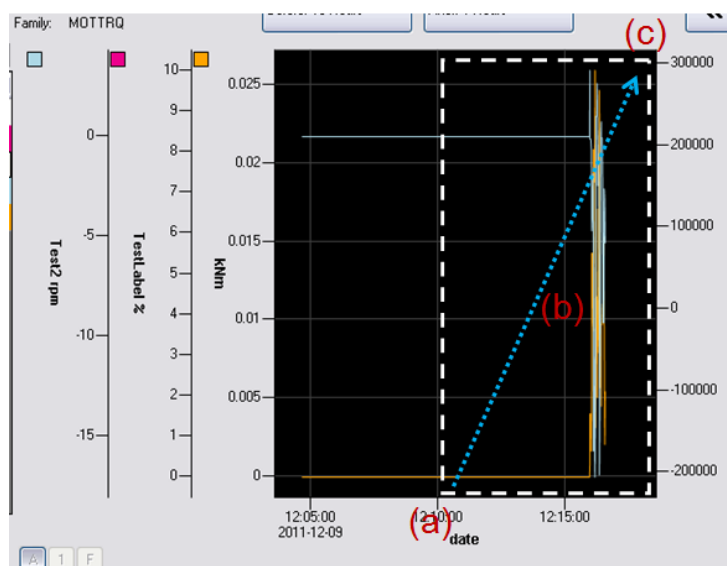


Figure 39 - Zooming

5.3.4. Adding alarm lines

It is possible to add a custom alarm line to any signal. This line will stay attached to its defined level and will rescale together with the signal.

To add an alarm line:

1. Choose Curve properties from the context menu available from the plot area.

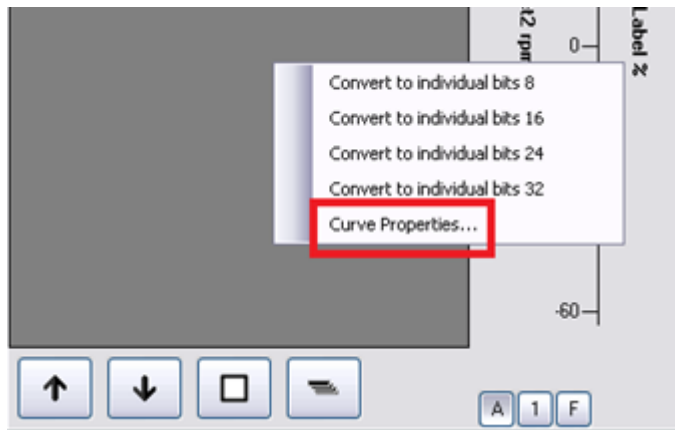


Figure 40 - Curve properties

2. In the new window choose Alarms and double-click its [Collection].

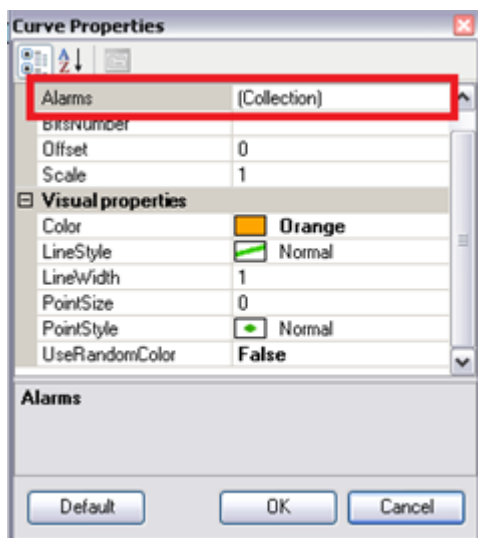


Figure 41 - Adding new alarm line

3. A new window with alarm lines options appears.

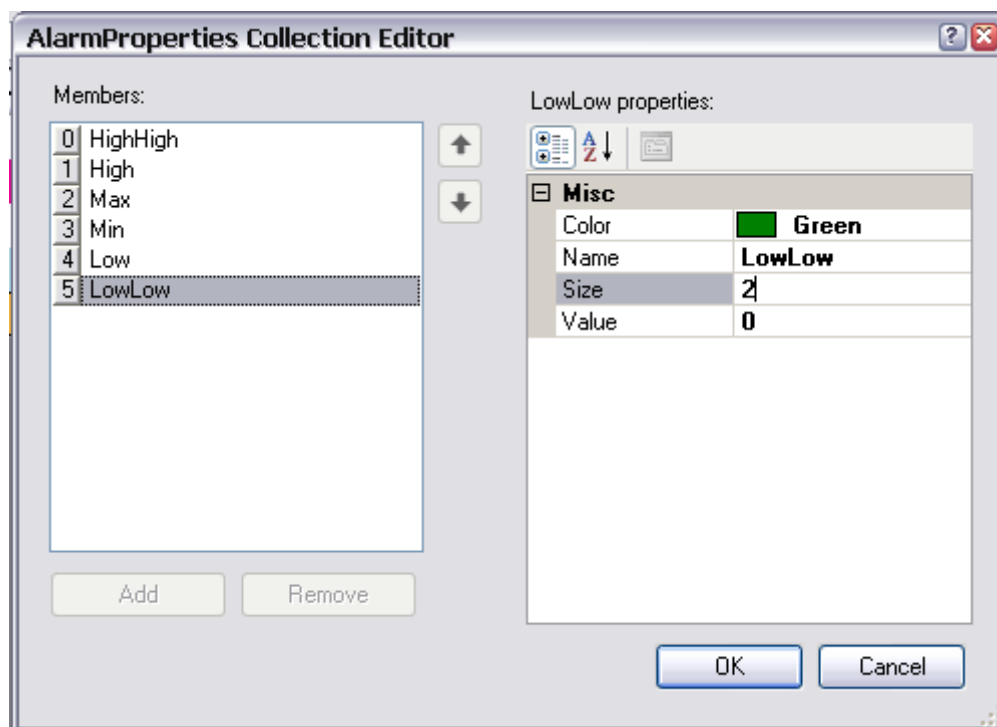


Figure 42 - Alarm properties collection editor

For every member, it is possible to choose:

- Line color
- Name
- Size (line width)
- Value (level) on which it should be placed (value for Y Axis)

After defining some alarms, the plot area can look like the example illustrated in the following figure.

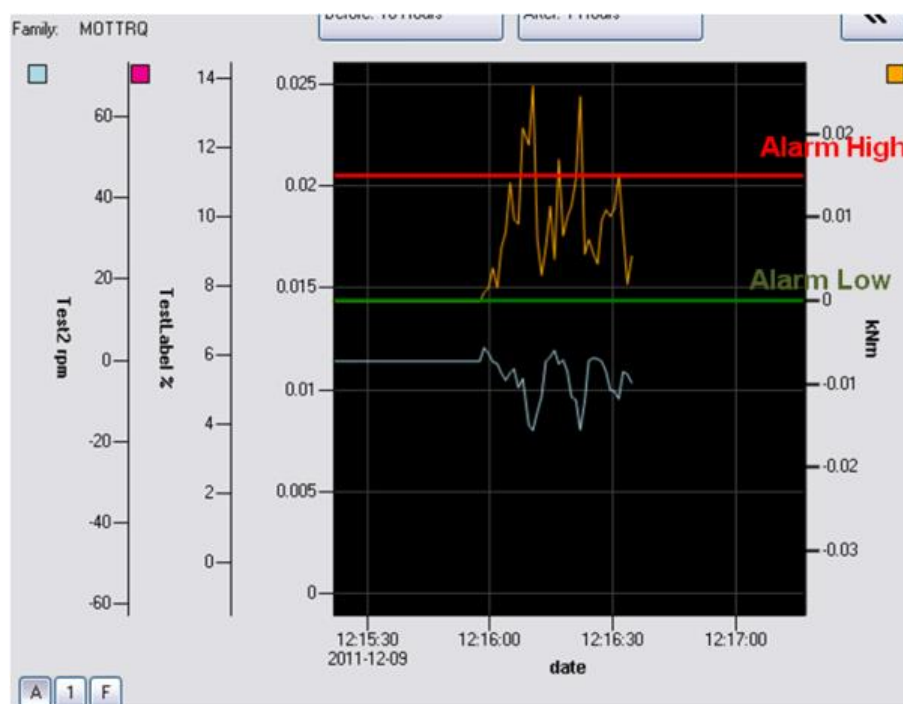


Figure 43 - Alarm level example

5.3.5. Signals selection and deselection

To select or deselect the signals in that node, right-click the **Variable** list.

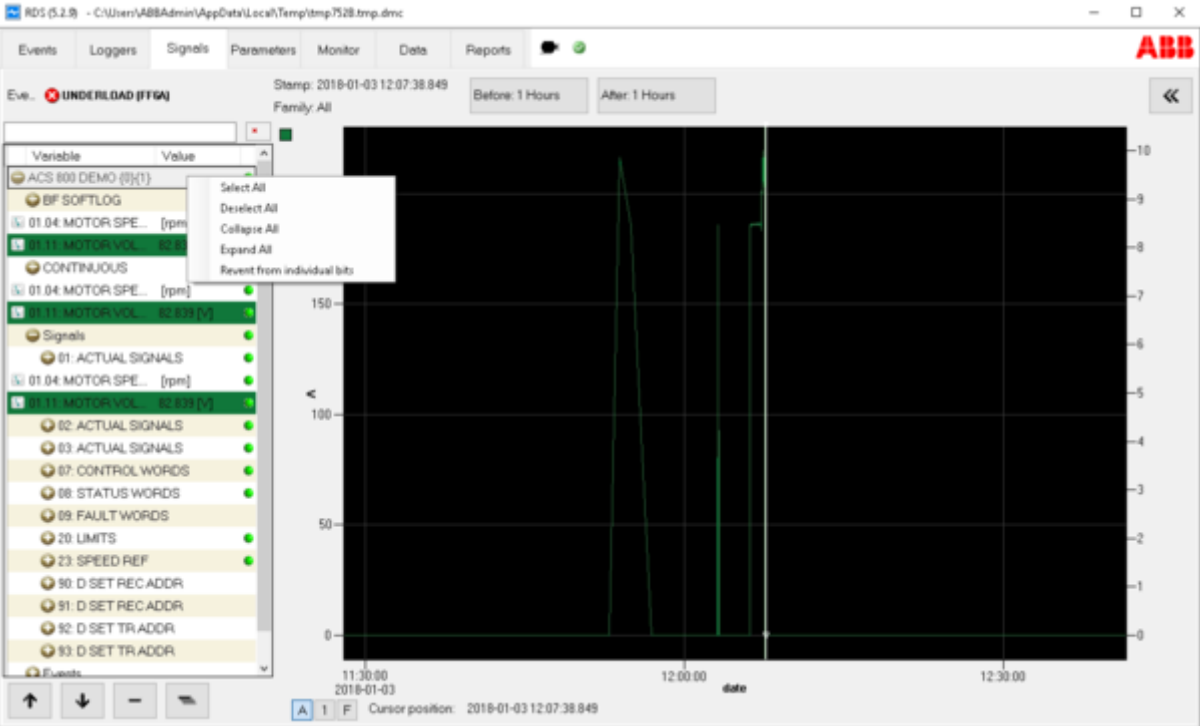



Figure 44 - Deselected Signals in the “Variable” List

It is possible to collapse and expand the list by right-clicking the folders in the “Variable” list.

 **It is possible to deselect signals from the plotting area by double-clicking the signal that is already selected in the variable list. Another, quicker method to remove (deselect) signals from the plot is to double-click on the square box that corresponds to the signal.**

5.3.6. Signal tooltips

When the cursor is moved on the plot, the variable name and the object involved (drive) is indicated in a text frame.

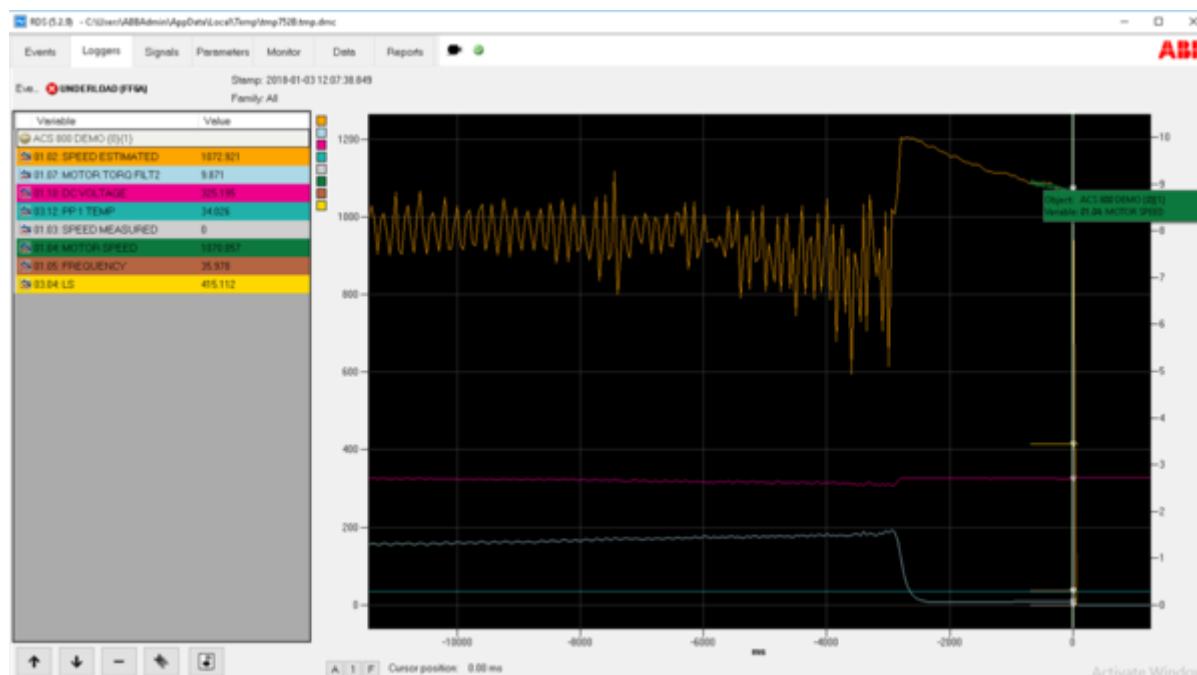


Figure 45 - Tooltips in the Loggers tab

5.3.7. Packaged boolean decomposition (for control and status words)

A signal can be represented in a binary format in the folders Loggers, Signals and Monitor tabs. This applies specifically to all word-type signals as well as packaged boolean. The example could be "main status word" or "alarm word" from frequency converter or a combined bit representation of alarms from control system.

By default all word and packaged boolean signals are displayed in the same way as any other analog signal. The following figure presents an example of main status word displayed as an analog signal.

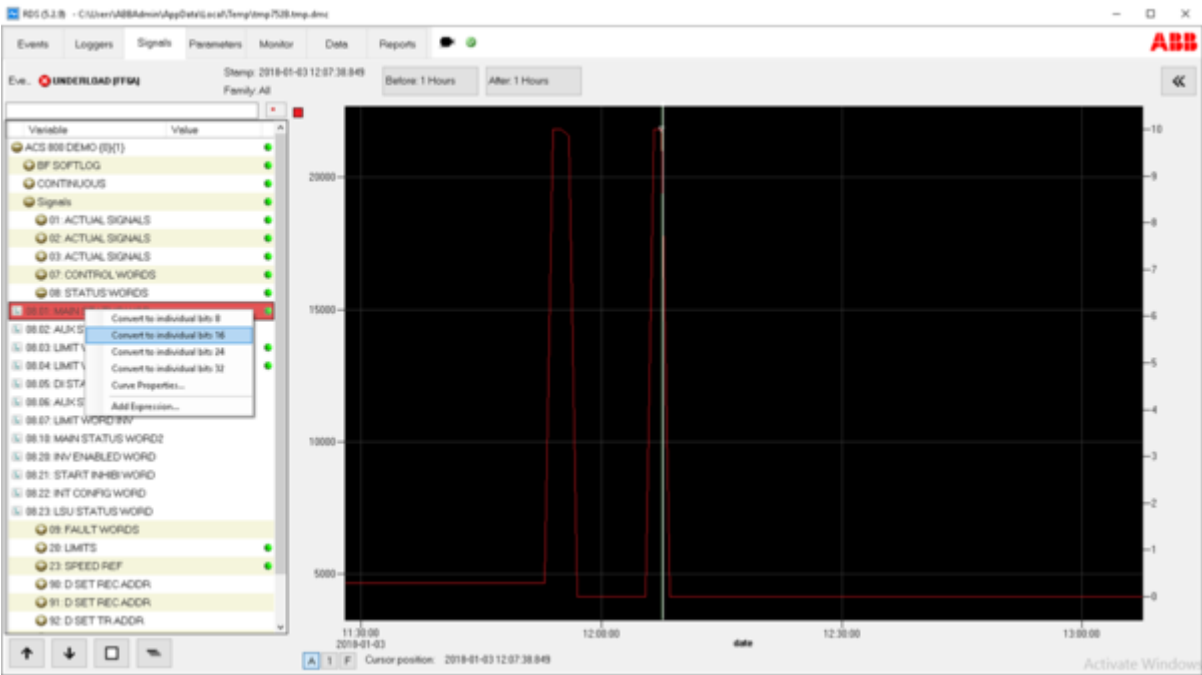


Figure 46 - Representing a packaged Boolean value

By right-clicking a signal, it is possible to choose to see either the first 8 bits, the first 16 bits or the first 32 bits. The result of braking down 16bit status word into individual bits is illustrated the following figure.

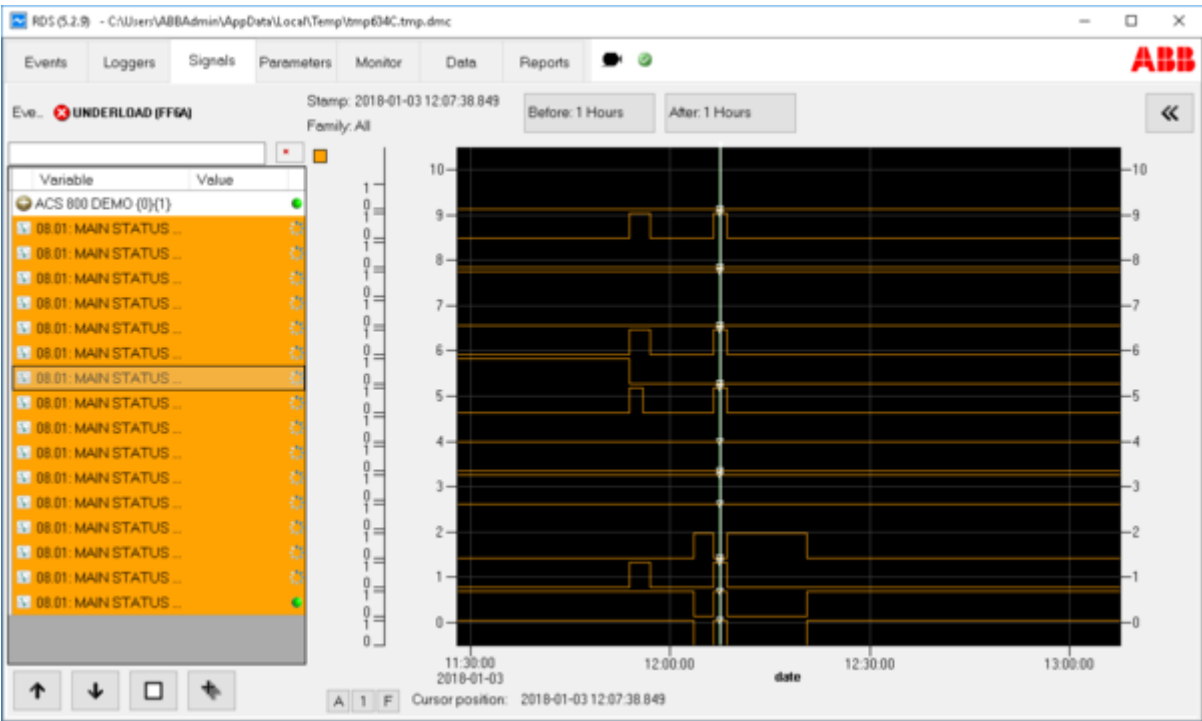


Figure 47 - Digital output representation (Selecting 16 bits)

5.3.8. Filtering functions

There is a filter bar in the **Signals** tab:



Figure 48 - Filter bar

With the the Filter bar, it is possible to search for signals with specified characters or word in its name. Follow this procedure:

1. Click the **Filter** bar:

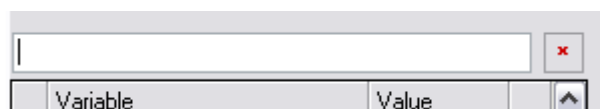


Figure 49 - Filter Bar

2. Enter the characters or the word that are / is part of the signals you are looking for, for example, "CURRENT".

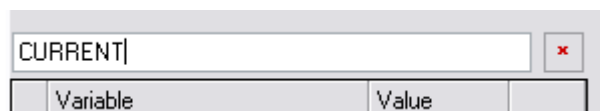


Figure 50 - Filter example

3. Only signals with the word "CURRENT" in it will be shown in the next window.

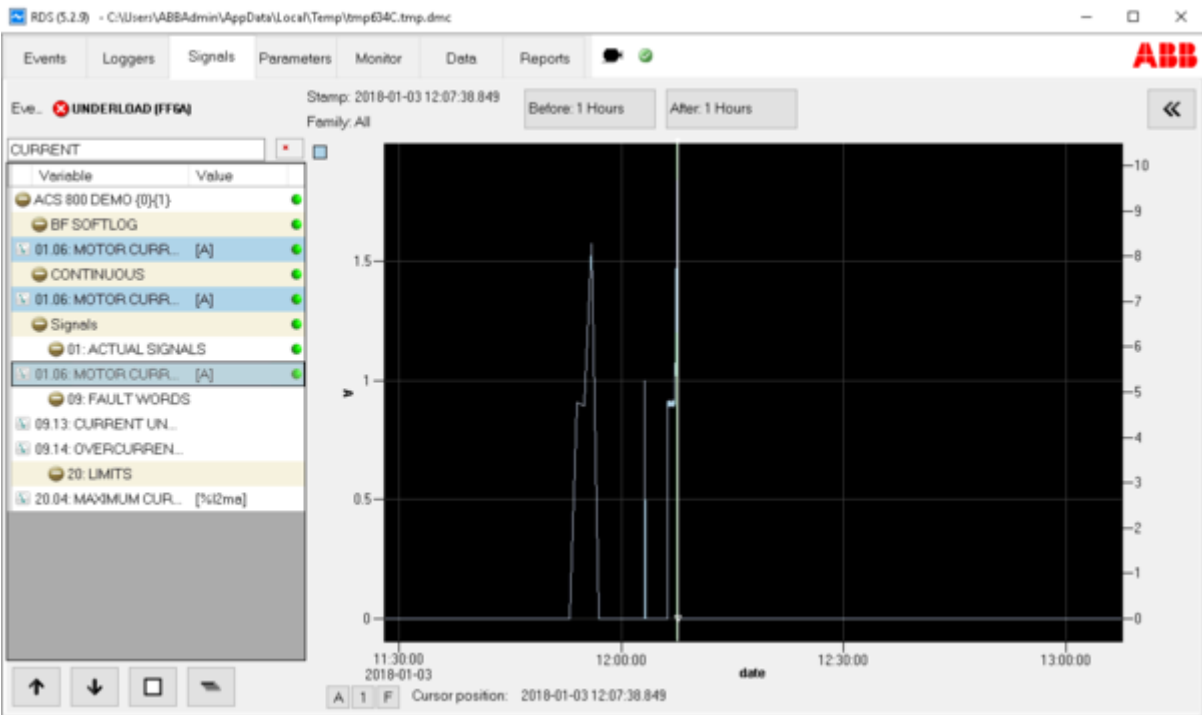


Figure 51 - Filtered signals

4. To exit the filtering function, delete the word from the bar. After deletion, no filter is applied.

5.3.9. Measurement verification in selected time range

There is a predefined time window in the **Signals** folder. The default setting is one hour before and one hour after the event. If there are signals represented in that time window, they are indicated by a green spot (next to the value) as illustrated in following figure.

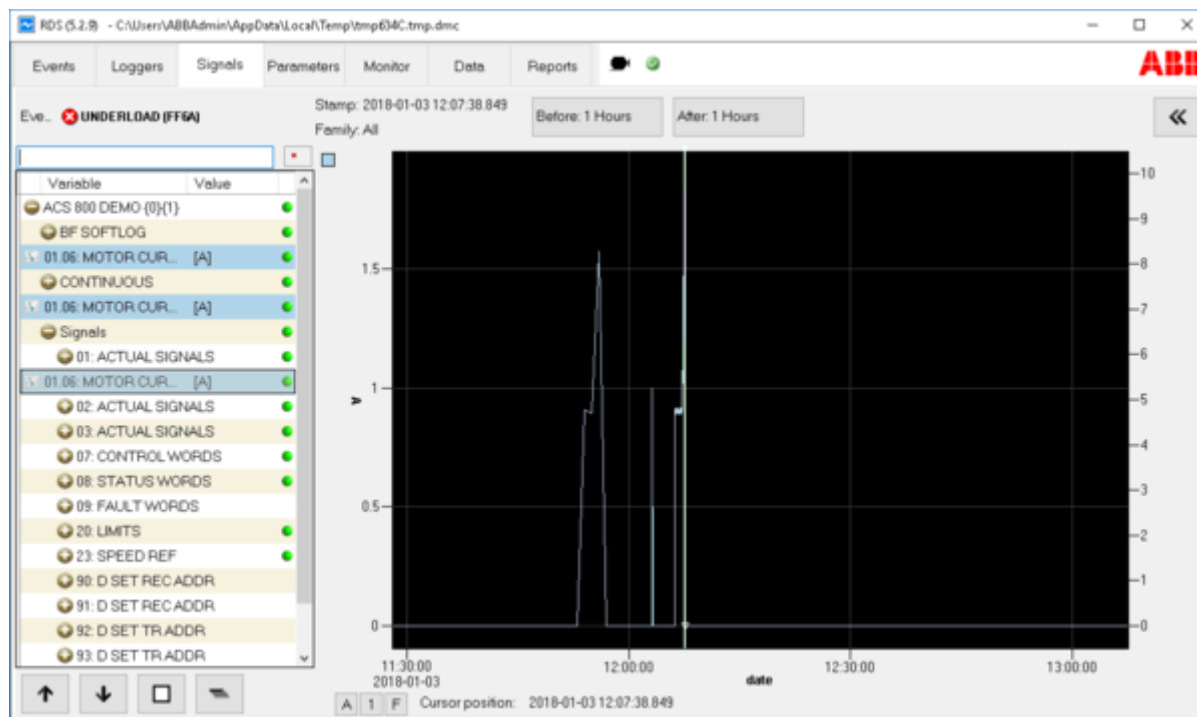


Figure 52 - Signals represented in a time window

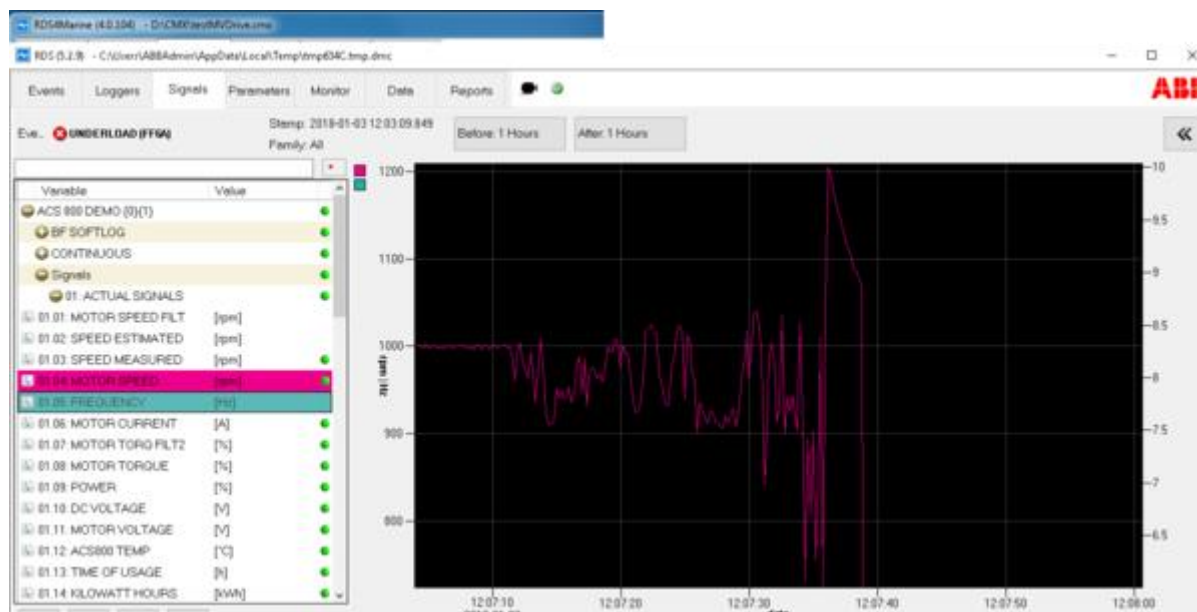


Figure 53 - Motor SPEED is represented (green spot) and frequency is not (no spot next to the signal)

5.3.10. Plotting colors

There are 12 different line colors set by the RDS and that are selected automatically. When all 12 signals have been selected, RDS will choose color No. 1 again for the next signal.

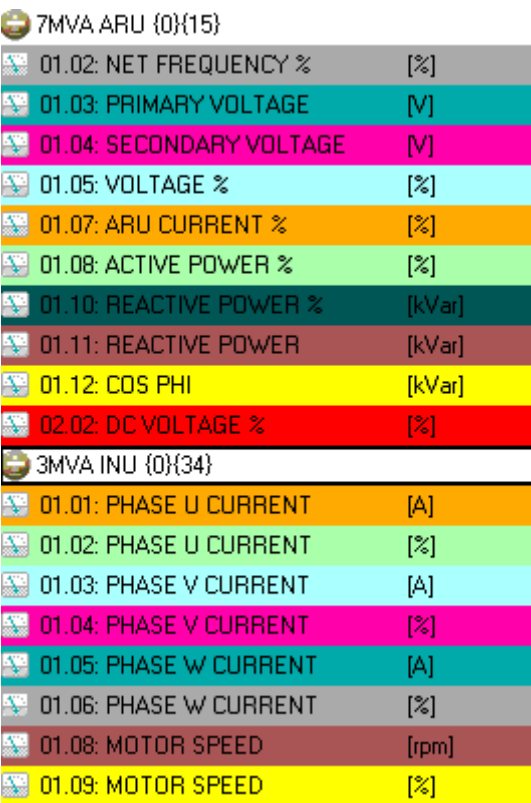


Figure 54 - Color palette

It is possible to change the color of the plot area as follows:

- 1. Click the plot area with the right mouse button. The following window appears:

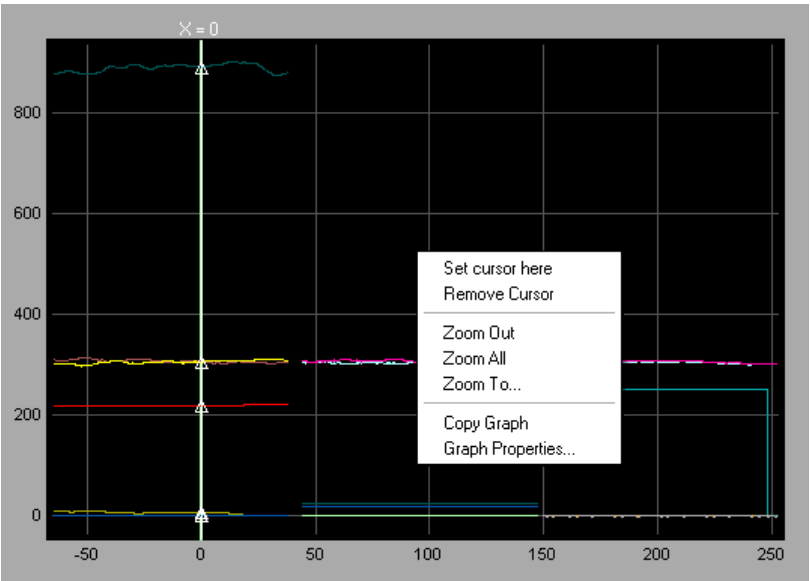


Figure 55 - Changing plot color

2. Select *Graph Properties* The following window appears:

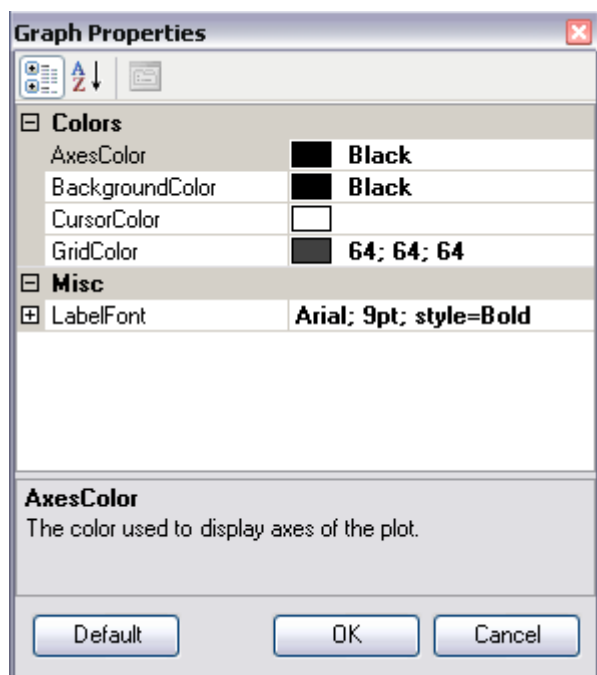


Figure 56 - Graph properties dialog window

In this view it is possible to customize the colors of the graph area and the label fonts, there are several colors to select from for the window base colors.

6. Remote access rules control

The setup of each customer remote access is made to restrict remote actions outside of rules and regulations. All ABB RDS users need to follow the following rules:

- Do not initiate any remote desktop session without customer knowledge.
- Wait for confirmation that Customer side has granted access.
- Do not initiate any remote action before customer side has verified that they are aware of the session, even though connection is established.
- Do not perform any action outside the data collection and monitoring purposes.

Once the link between onboard RDS and ABB RAP platform has been established and in order to control the access to the system from remote users, VSE application installed on RDS connectivity PC onboard provides to customer (onboard crew) functionality to control access from remote.

6.1. Controlling remote access rules

Perform the following procedure to edit the access rules controls:

1. On the RDS PC located onboard that is connected to the Internet, double click on the VSE application icon.



Figure 57 - VSE login icon

2. Log into local VSE web server with the following user/pass: admin/admin
3. From the top menu click **Administration & Security > Security Policy**.

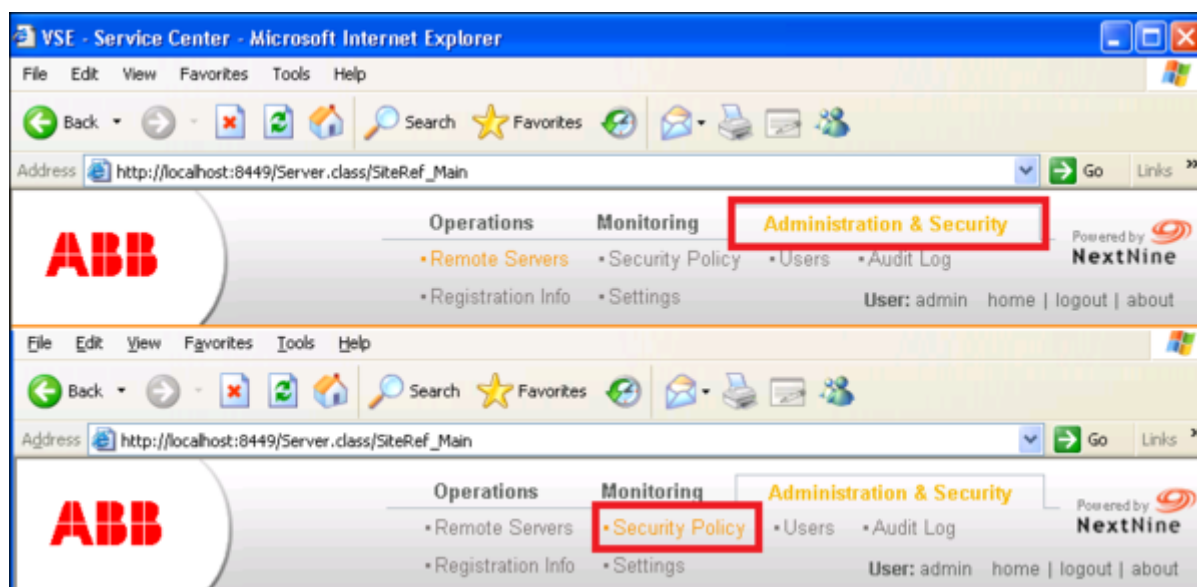


Figure 58 - Admin security page

4. Click **Edit** to set the standard settings.



Figure 59 - Edit standard settings

- Change the type of action e.g. Remote Access or Remote Send File (left screenshot below) and assign the Permission to it (right side). For instance if Action is set to Any and Permission is set to Requires Approval, all activities from remote would require approval from onboard crew before ABB support engineer accesses the RDS onboard.

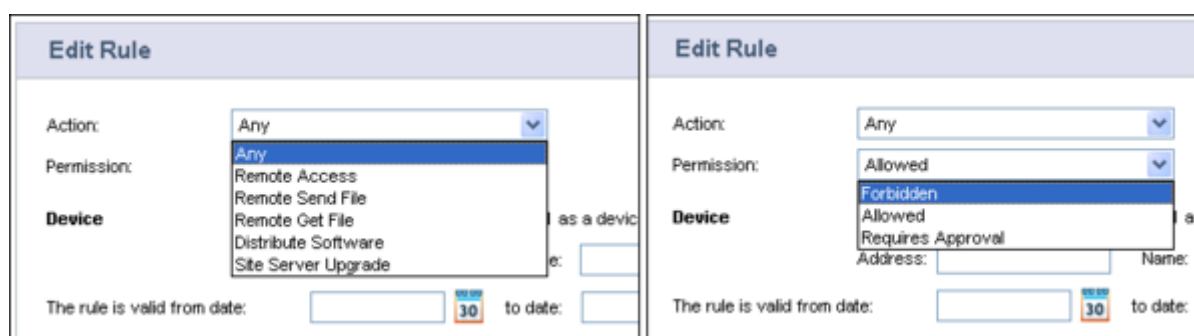


Figure 60 - Edit rules



It is recommended to control the access rules with use of VSE configuration instead of simply disconnecting the network connection cable from RDS computer.

6.2. Remote access approval

Before ABB personnel can access the system remotely, an operator aboard the vessel must first approve the remote access request. This is done by the following procedure:

- On the RDS PC connected to the Internet open VSE by double-click the icon.



Figure 61 - VSE login icon

- New Internet Explorer window will open with request to activate active content. Right-click on yellow bar and choose "Allow Blocked Content...".



Figure 62 - Allow blocked content in IE

3. Log in to VSE with the following default credentials:

Username: admin

Password: admin

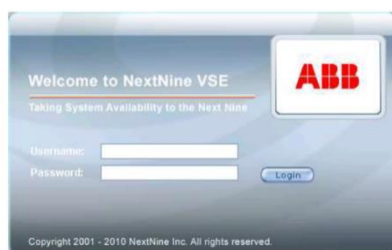


Figure 63 - VSE login

4. If there is an active request waiting, a message should automatically pop up asking if the user wants to navigate to the **Remote Activity Monitor** page, click "OK". If the pop-up window does not appear, manually browse to "Devices > Remote Activities".

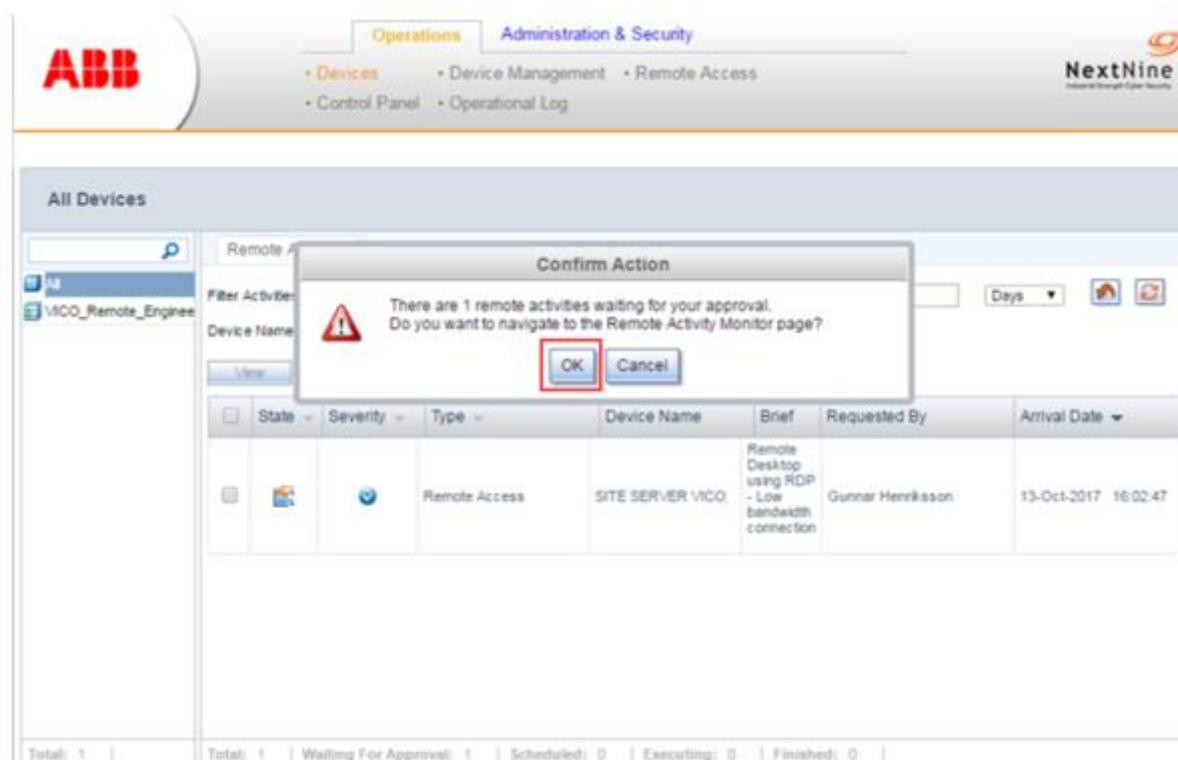


Figure 64 - Remote activity monitor page

- After inspecting the request (what type of access is request, by whom the request is made), select the check box on the left side of the request and then click the “Approve” button.

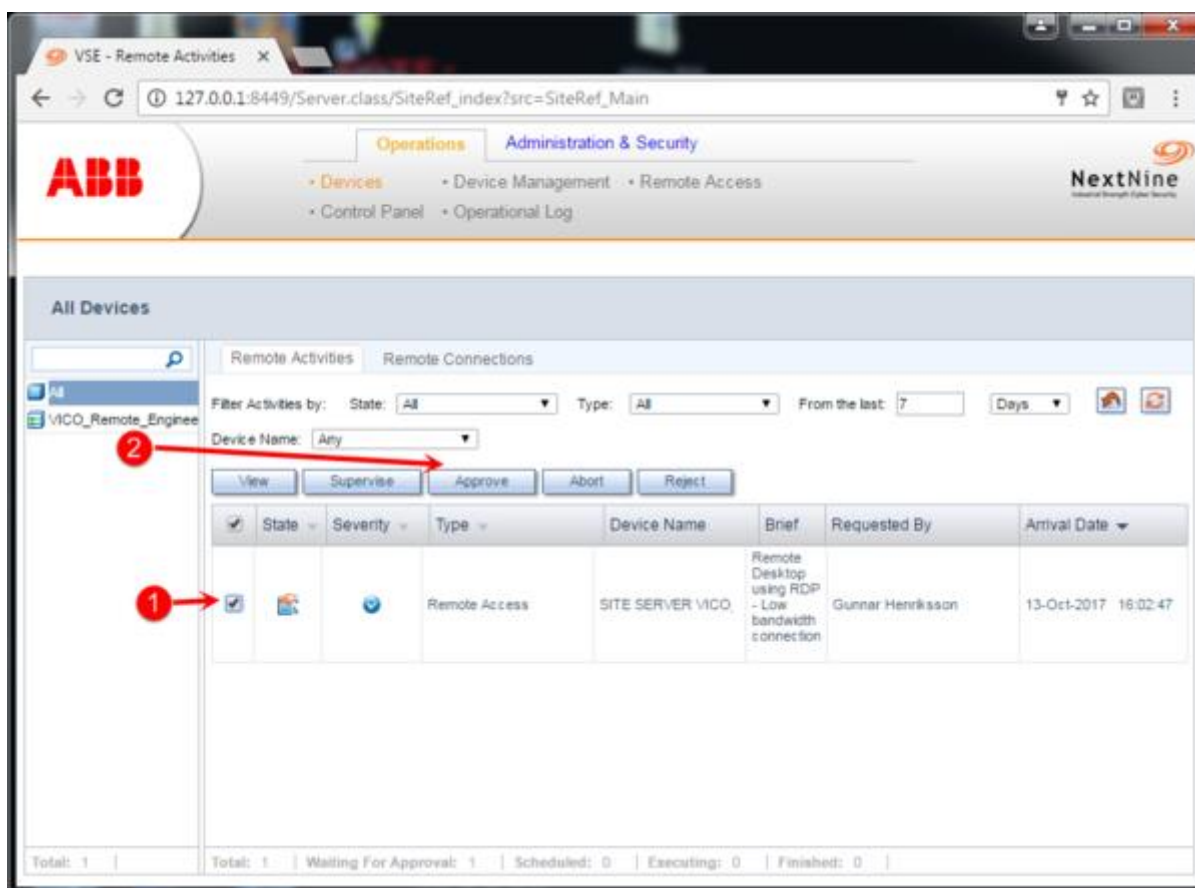


Figure 65 - Select request for approval

- An approval window appears, the time for how long the remote access will be available can be set here. Change the time if desired, and then click the “Approve” button.

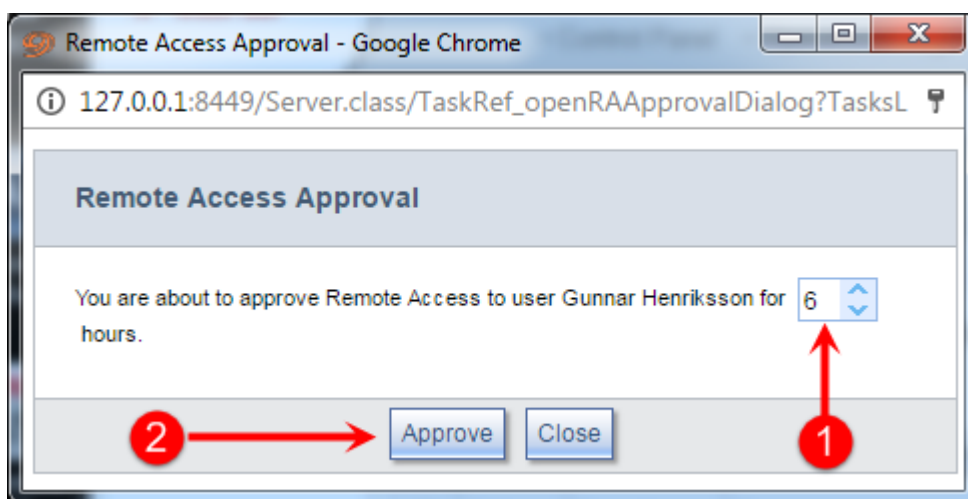


Figure 66 - Approve for a time period

- A message will appear confirming that approval has been granted. Click the “OK” button and close VSE. The remote access will automatically be disconnected after the time that was specified earlier, no further input from the operator is needed.

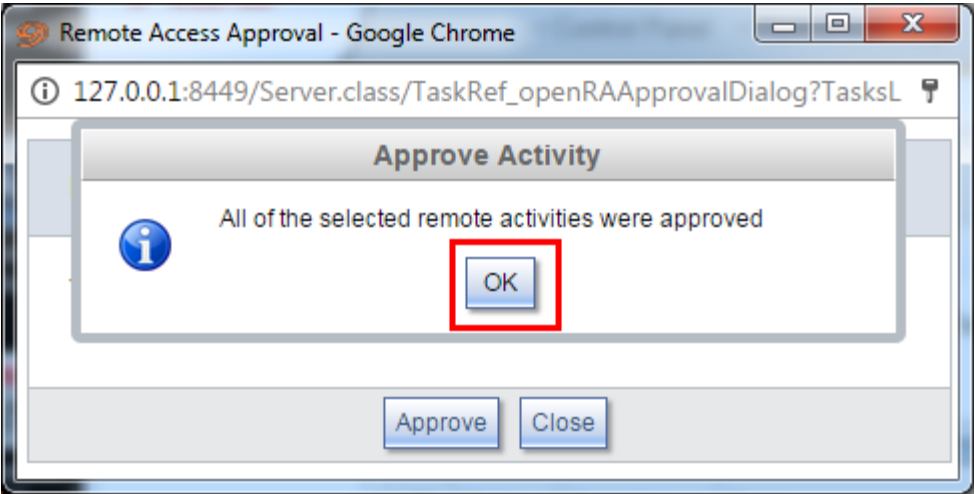


Figure 67 - Confirmation of approval

7. Troubleshooting

7.1. RDS is not collecting data from the VFD

1. On the main RDS computer, start TightVNC Viewer and connect to RDS computer using correct IP address of the computer you need to troubleshoot.



Figure 68 - TightVNC Viewer icon



Login credentials for TightVNC Viewer are handed over to customer as a KeePass password database after commissioning of the RDS system. ABB keeps a copy of the passwords.

2. Using standard Windows menu start, reboot the RDS computer.
3. In case RDS computer is not accessible on the VNC, reboot it. To reboot, press and hold the reset button on the front panel of RDS computer for 3 seconds and release.

7.2. RDS is not collecting data from MV Switchboard

1. Log in to main RDS computer as LocalAdmin



Login credentials for LocalAdmin are handed over to customer as a KeePass password database after commissioning of the RDS system. ABB keeps a copy of the passwords.

2. Double-click the Service icon to open the **Services** manager.



Figure 69 - Services icon

3. In the service manager navigate down to see the status of **RDS DataCollector Service** and **RDS Storage Service**. Make sure both are in **Running** mode (see below). In case any of them is not started, right-click on the service and click **Start**.

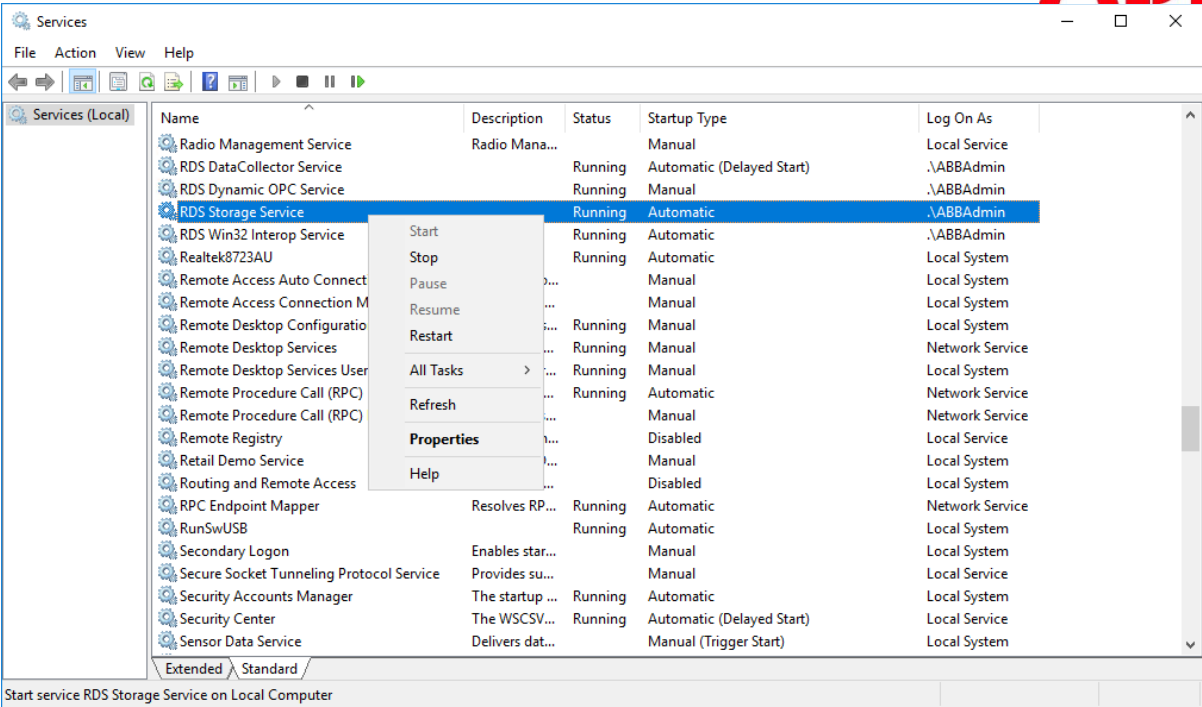


Figure 70 - Start RDS services

4. If the necessary services will not start, reboot the RDS PC.

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