

SUPERINTEND VRE-08/16/32/64

Residual Current Monitoring System (RCM) for Grounded Electrical Systems 8/16/32/64 supervision points

Operator Manual v2.00

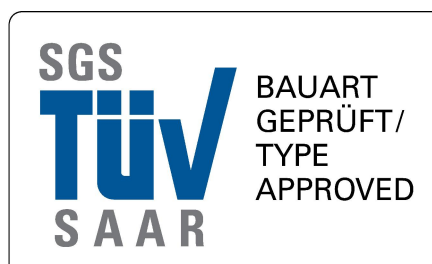


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Information in this document is subject to change without notice

1 GENERAL

1.1 RESIDUAL CURRENT MONITOR VRE-08/16/32/64

VRE-08/16/32/64 is a microprocessor based supervision unit for 8/16/32/64 supervision points in a grounded (TN-S) distribution network. The main specifications are:

- simultaneous monitoring of all channels in the main display mode
- display of the absolute value of the fault current in the range 2 mA–20 A for each channel
- channel specific alarm settings: alarm limit and alarm delay
- alarm memory
- possibility of channel specific fault current warning (1–100% of alarm limit)
- continuous channel specific self testing of the measurement chain (can be disabled) and equipment failure alarms
- equipment failure memory
- possibility to name the supervision points (=channels)
- memory for the maximum and minimum value of the measured fault current
- external transfer of the alarm and the warning: potential free change over contacts for both, 230 VAC, 8 A
- continuous self testing of the equipment: confidence and operation reliability
- DIN 43700 panel installation
- clear control panel: graphical back-lit LCD display, 7 buttons and 6 led's
- visual presentation of the fault current: virtual analog meter and waveform display
- selectable user language: English, Finnish, Swedish
- Ethernet connection (RJ-45, 10Base-T)
- WWW remote user interface, which can be operated via Ethernet or Internet

VRE-08/16/32/64 residual current monitors have been designed to be used by qualified electrical personnel.

Using the devices in other ways than stated at the operating instructions is prohibited, misuse can cause a dangerous situation.

The devices do not contain user serviceable parts. Concerning the service issues, please contact the manufacturer (contact information: see 6 Warranty).

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1.2 WHAT IS FAULT CURRENT?

In a "clean" five-conductor (TN-S) distribution network the returning current flows through the neutral conductor (N) or the phase conductors (L1, L2, L3) back to the zero point of the distribution transformer (figure 1.1). If there are faults in the distribution network the neutral conductor is in partial or complete short cut with the ground conductor (G) and the conductive parts of the building.

Due to nonlinear loads and harmonics the neutral currents are high. This returning current is divided between the neutral conductor (I_N), ground conductor (I_G) and the conductive structures of the building (I_{gnd}) according to their impedance. **The fault current consists of all the partial currents, which return using other routes than the neutral or phase conductors back to the zero point of the distribution transformer (I_G+I_{gnd}).**

The simplest way to determine the value of the fault current is to measure the the current of the ground conductor. The measurement doesn't however give absolutely right information of the situation, because part of the current also comes back through the conductive parts of the building. The real value can be measured with a so called sum current measurement ($I_{\text{sum}} = I_{L1}+I_{L2}+I_{L3}+I_N$). The instantaneous sum of the currents going into the load and returning from the load are being supervised. If the sum current differs from zero, part of the current is going through "illegal" routes and returns to the main ground busbar as fault current.

There is so called natural leakage current present in all five-conductor (TN-S) networks. Current comes for example from the insulation impedance of the devices and the network, components used to eliminate the network interferences and stray capacitances in the network (filters, big groups of fluorescent lights etc.).

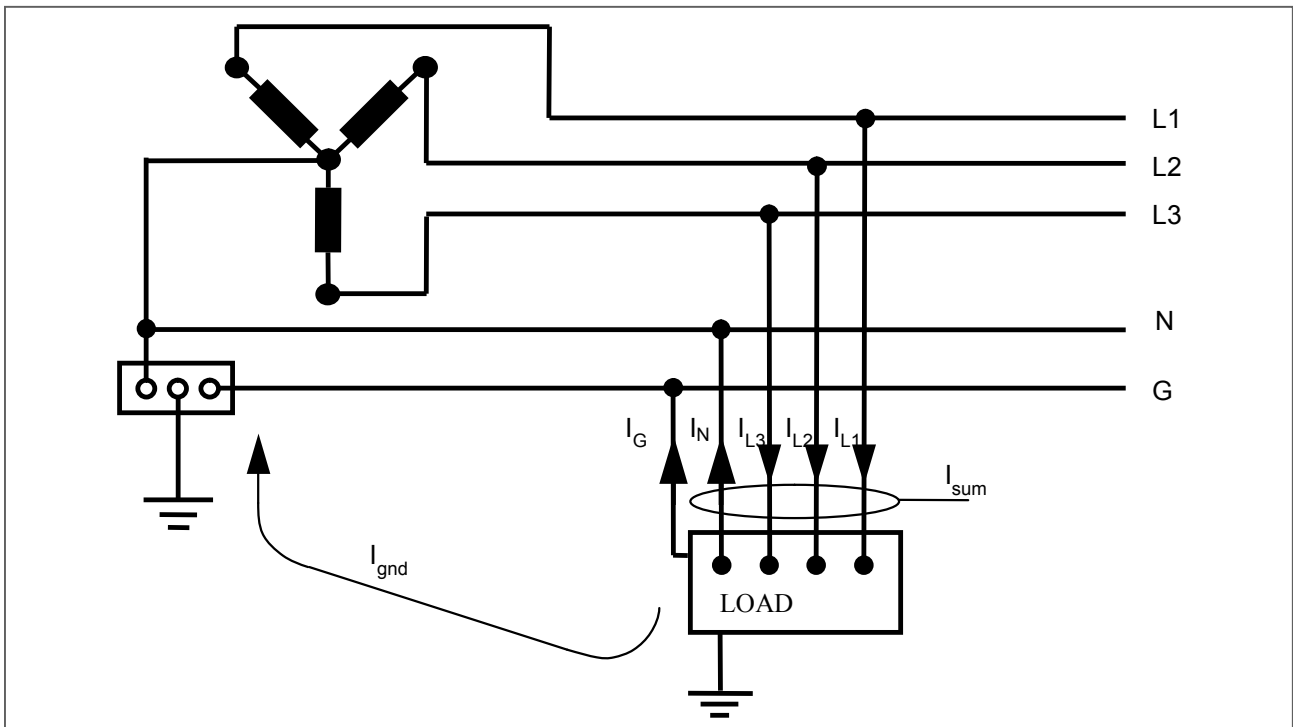


Figure 1.1. The principal structure of the grounded distribution network and the measuring of the sum current

1.3 INTERFERENCE CAUSED BY FAULT CURRENT AND SUPERVISION

Differences in ground potentials and interference fields

Fault currents cause differences in ground potentials and noise voltages. Although these don't interfere with the devices connected in the network, electrical interference fields can insert interfering fault currents in the grounding circuits of sensitive electronic devices. Fault currents generated in the grounding circuits are outstandingly harmful in computer and surveillance networks, especially if the fault currents insert to the data lines of the devices.

The optimum advantage of a five-wire network is achieved by assuring that the neutral (N) and protective (PE) conductors are kept separate. This makes sure that the possible high frequency interference in the N conductor can not get to the grounding circuits of electronic devices. Appropriate function of a TN-S network can only be assured with fault current monitoring.

Detecting of installation faults

Fault current is increased by failure situations in the network, which are installation faults or insulation faults of devices connected to the network. These failures can exist as both partial and complete short cuts between the protective conductor and power supply. Detecting a failure at early stage and removing it in time are very important things to secure the appropriate operation of a TN-S network. Continuous fault situation could be dangerous for users and devices connected to the network and to the network itself (overheating and risk of fire)

With a supervision unit the installation faults can be noticed immediately when they are created. Possible installation faults:

- N and PE conductors are coupled somewhere else than in the main earth circuit connector
- N and PE conductors are cross-wired
- load connected between phase and protective earth
- load is grounded through its fasteners

Detecting cable faults and anticipating the maintenance

The most usual cause for reaching the cable ignition temperature is the damage of the wire insulation. Insulation can be damaged by both overload and mechanical stress. Supervision equipment reveals incipient conductor fault or weakened isolation level of some device (motors and air supply units etc.) as the fault current level increases.

2 EQUIPMENT

2.1 SUPERVISION SYSTEM

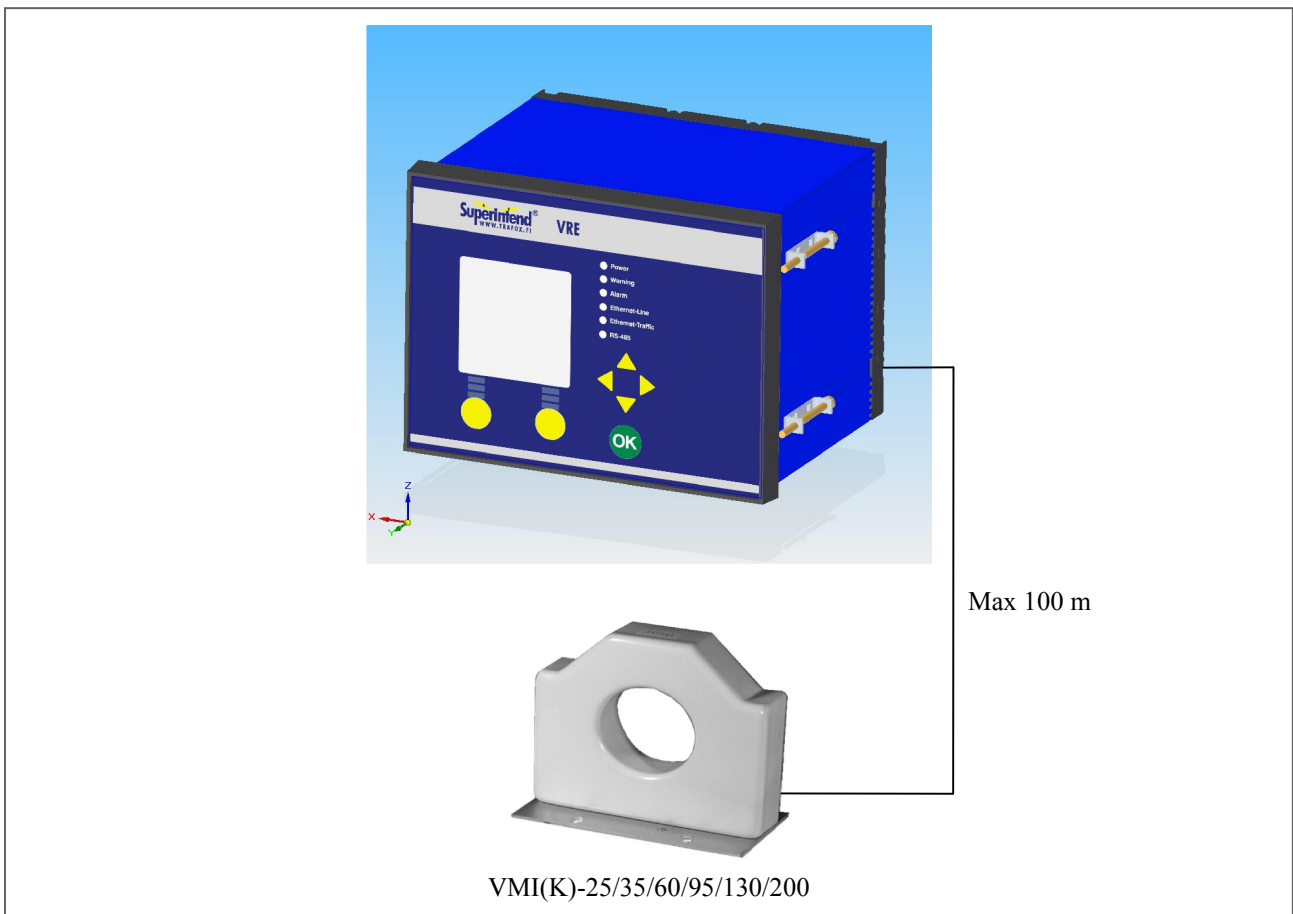


Figure 2.1. Configuration and connection of the supervision system

Equipment consists of parts seen in figure 2.1:

- VRE-08/16/32/64 Central Processing Unit (CPU)
- VMI(K) Sum current transformers, max. 8/16/32/64 pcs

CPU VRE-08/16/32/64 is a measurement computer of 8/16/32/64 channels, where can be connected one measurement point per channel.

Sum current transformer is connected directly to the CPU either with standard cables (VMP1/2/5/10) or by the terminal block using an instrumentation cable. Standard cables come in lengths of 1, 2, 5 and 10 meters. When using instrumentation cable the maximum distance is limited by the loop resistance, which can not be over 3 Ω (for example KLAM max. 100 m)

Fault current can be monitored both on the device's own display and via the WWW remote interface (see chapter 4 WWW Remote Interface).

2.2 FAULT CURRENT MONITOR AND INSTALLING

2.2.1 THE FRONT PANEL

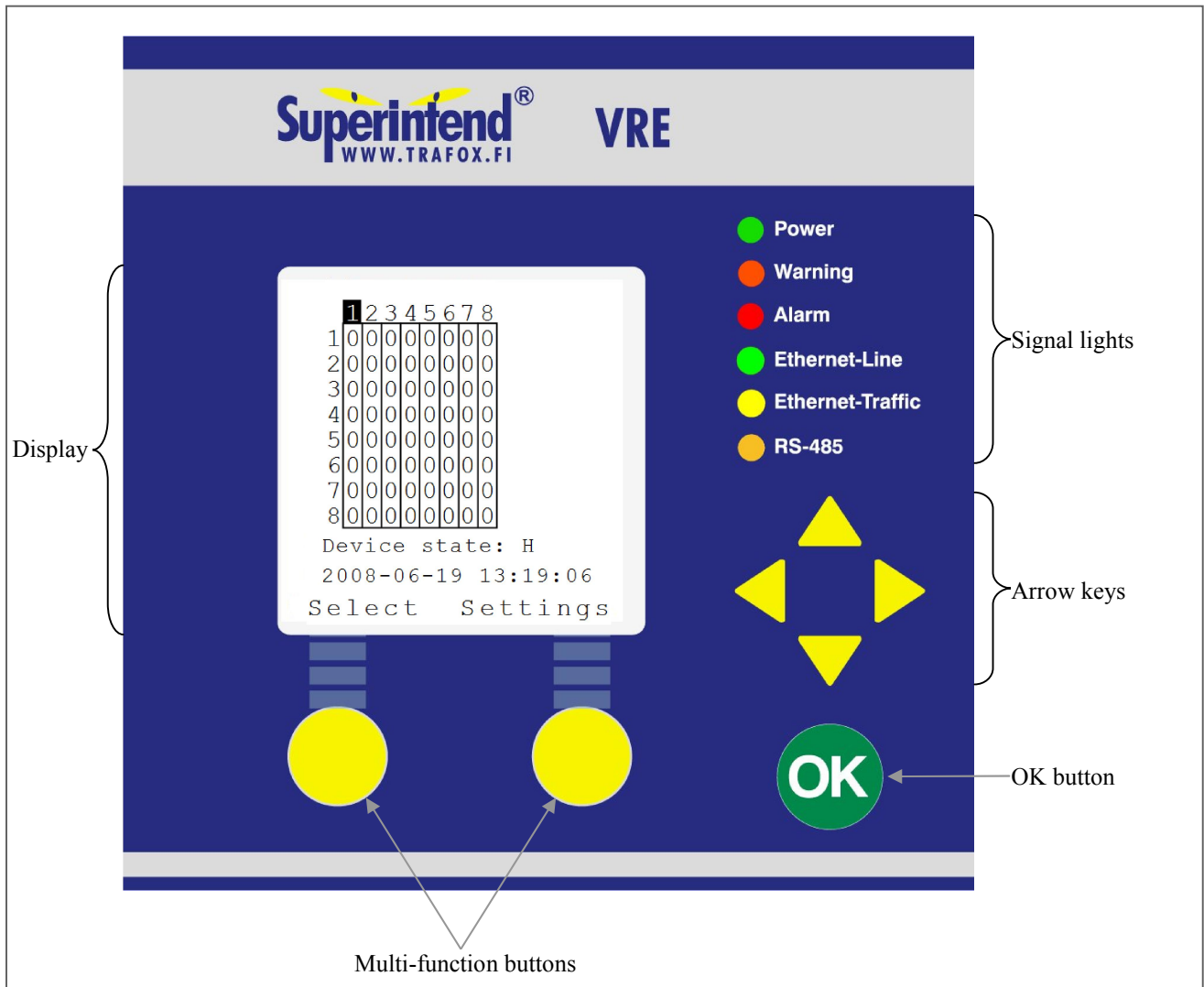


Figure 2.2. Fault current monitor VRE-64's front panel without the empty part on the right side of the panel

The front panels of the fault current monitors VRE-08/16/32/64 have similar functionality.

Display

The operation of the fault current monitor can be observed from the display on the front panel (see chapter 3 Display). The states of all channels are shown on the display after the system has started (see chapter 3.3 Main display). Channel display can be initiated from the main display. Groups of eight channels can be observed simultaneously (see chapter 3.5 Board specific display). The history data and the settings of the channels can be accessed from the channel specific display. The device settings can be seen and modified from the main display too (see chapter 3.8 Device setup menu)

The backlight of the display is lit when the operation voltage is applied. The light goes off when no button has been pressed in five minutes. The light goes on again when a button is pressed. This button pressing causes no other action to the device. Backlight is on continuously when there is at least one non-acknowledged alarm present in the device.

Buttons

Buttons are used to control the operation of the device: move from one display to another, make the required channel and device settings and acknowledge the alarms. Arrow keys are used to navigate through the menus vertically and horizontally both between the display modes and inside a display mode. The multi-function buttons under the display are used to move from one display state to another and confirming different selections; the purpose of use is shown always on the lowermost row on the display. OK button is used for alarm acknowledgement.

Signal lights:

There are six signal lights in the front panel of the CPU:

<i>Power</i>	Light is on always when the device is connected to supply voltage.
<i>Warning</i>	Light is on when at least one channel is in warning state (see chapter 5.2 Operation of the warning relay and light).
<i>Alarm</i>	Light is flashing when there is at least one non-acknowledged fault current alarm, equipment failure or equipment fault causing an alarm (see chapters 5.1 Operation of the alarm relay and alarm light and 5.3 Equipment faults). The light goes off after all of the alarms have been acknowledged.
<i>Ethernet-Line</i>	Light is on when the Ethernet interface is in use with functioning network settings (see chapter 3.8.5 Ethernet setup display) and a cable connected to a local area network is connected to the RJ45-type Ethernet connector J5.
<i>Ethernet-Traffic</i>	Light is flashing when a user is connected to the device via the WWW remote interface and data is being transmitted between the device and the remote user.
<i>RS-485</i>	Not in use at the moment.

2.2.2 MECHANICAL INSTALLATION

Device is to be installed in a planar installation surface. The size of the needed installation hole for each device type can be seen from the table below. Left picture shows the maximum dimensions of the front frame. In the right picture the size of the installation hole is told according to the frame size (see the table below).

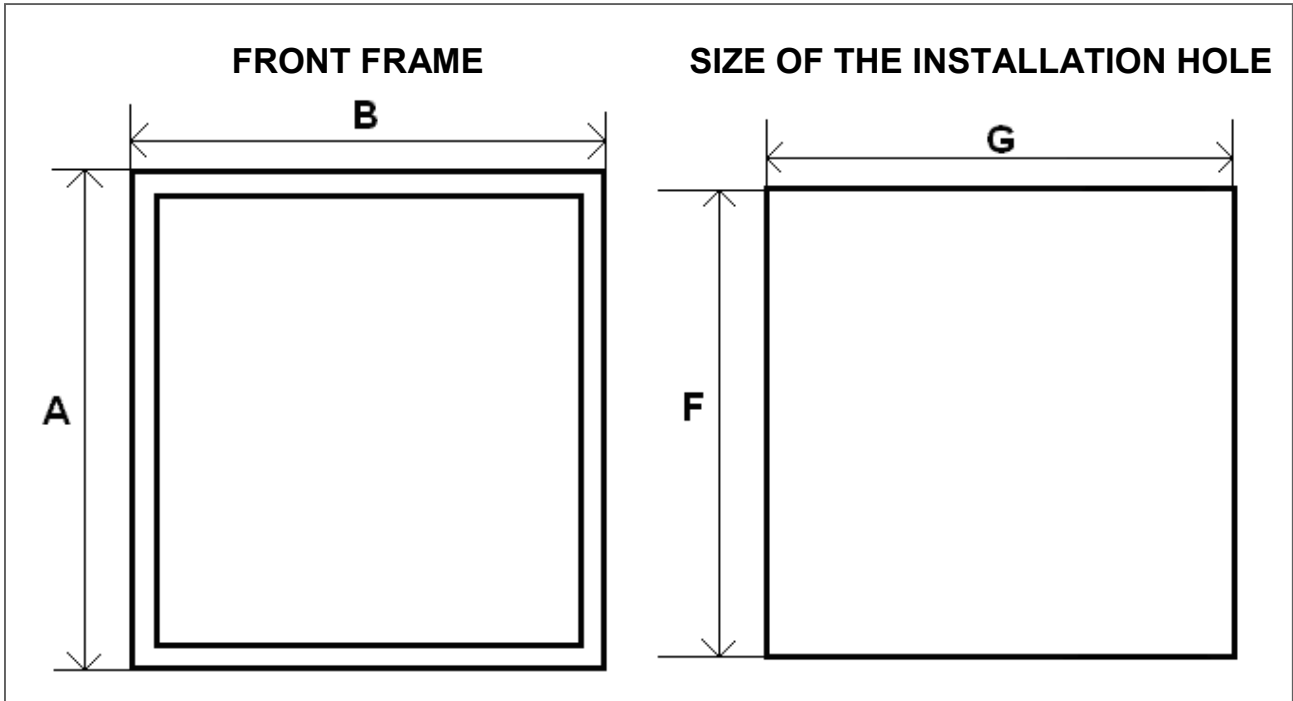


Figure 2.3. Dimensions of the installation hole

	A (mm)	B (mm)	F max (mm)	G max (mm)
VRE-08	144	144	138 + 1.0	138 + 1.0
VRE-16/32	144	192	138 + 1.0	186 + 1.1
VRE-64	144	288	138 + 1.0	282 + 1.3

The essential dimensions for installation can be seen from the figures below. The connectors and the plugs to be installed to the connectors must be taken into account when selecting the installation space and place. In case the device is installed in an opening door of an instrument cabinet, the cable plugs connected to the back panel must be absolutely taken into account. It must be made sure that the possible door can be closed freely and there are needed insulation distances present between the connectors and the other components in the installation space.

The location of the installation hole must be checked carefully if the device is installed for example near the sidewall of a cabinet. It must be checked that the fasteners supplied with the device can be used and the screws can be tightened freely with a screwdriver.

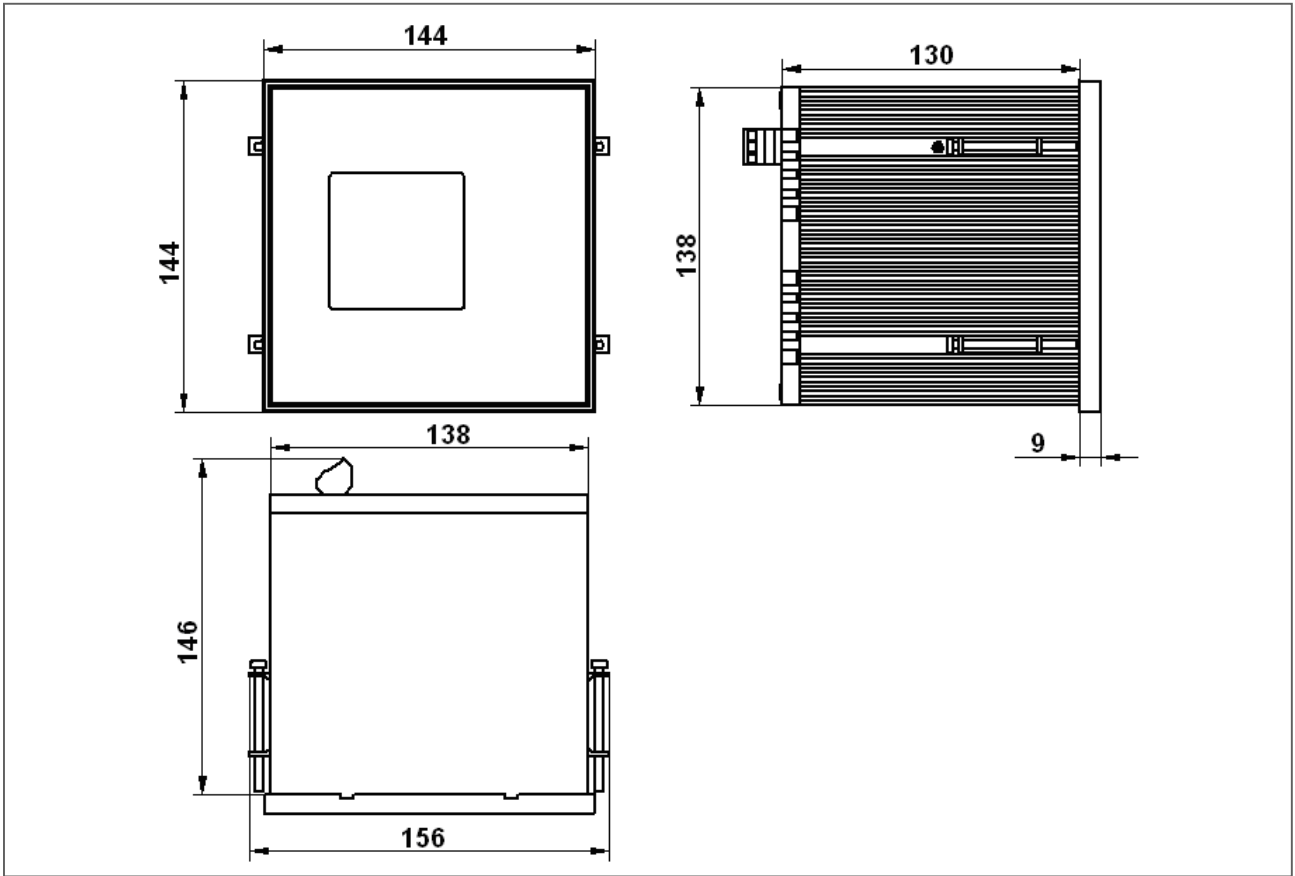


Figure 2.4. Dimensions of VRE-08

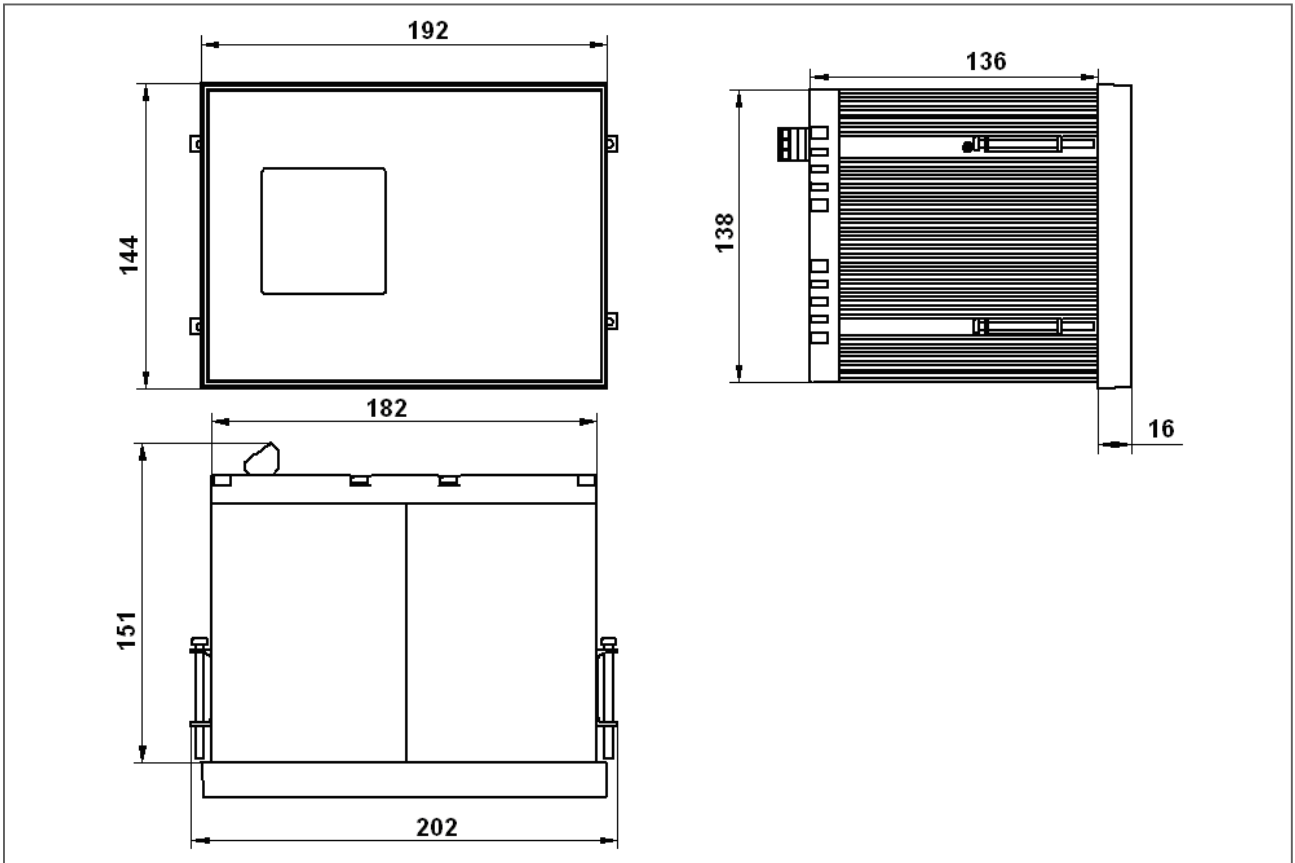


Figure 2.5. Dimensions of VRE-16/32

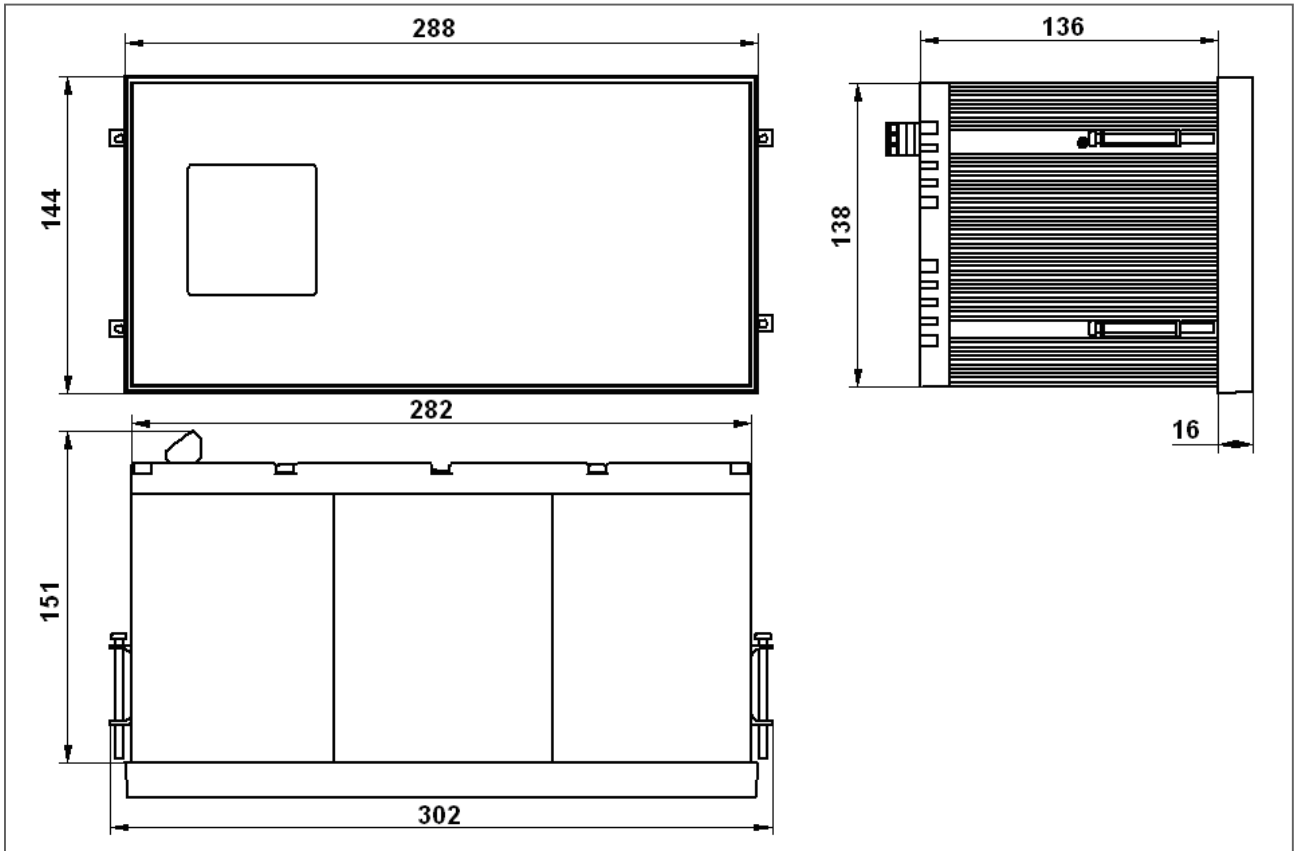


Figure 2.6. Dimensions of VRE-64

In the next photographs can be seen how the device is attached to a hole made in an installing surface. The hole size recommendations are seen in the above-mentioned tables. The device is pushed into the hole so that the front frame of the device is in the same level with the installation surface. The fasteners supplied with the device (4 pcs) are installed to the device as seen in the photographs. The screws are tightened with a screwdriver (tightening torque: 0.5 Nm). Tightening fastener pulls the front frame tightly to the installation surface.



Figure 2.7. Installation of the fasteners

2.2.3 ELECTRICAL INSTALLATION

All connectors of the device are located in the back panel:

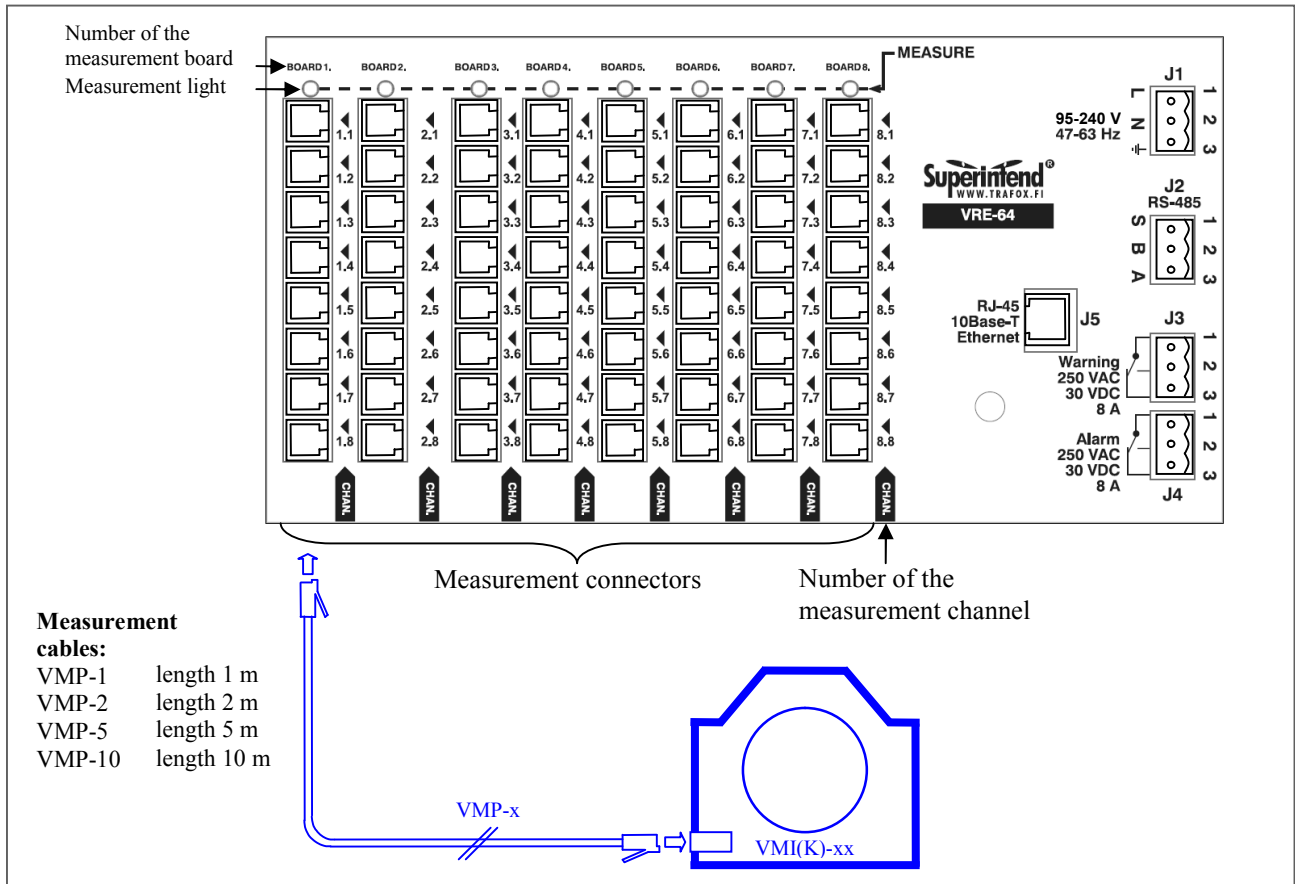


Figure 2.8. Back panel of the fault current monitor VRE-64

Connectors for supply voltage, relays and Ethernet

Connectors J1 – 5 are similar in all models:

- J1 Supply voltage connector. The protective earth connector must be connected to the earth bar.
- J2 Not in use at the moment
- J3 Warning relay connector. In the diagram the relay is pictured in warning state, the device is powerless (connector pins 1 and 3 are connected).
- J4 Alarm relay connector. In the diagram the relay is pictured in alarm state, the device is powerless (connector pins 1 and 3 are connected).
- J5 Ethernet connector. When using the WWW remote interface a cable connected either to a local area network or to a computer is needed.

NOTE! The network cable must be of cross-over type if the VRE device is connected directly to a remote user computer.

Measurement connectors

In the VRE-08/16/32/64 devices the measurement channels consist of eight measurement boards (eight channels each). The number of boards is dependent of the device type:

VRE-08	1 measurement board
VRE-16	2 measurement boards
VRE-32	4 measurement boards
VRE-64	8 measurement boards

The measurement channels are numbered so that the channel number consists of the measurement board number and the channel number inside the measurement board. For example channel 1.6 is the channel 6 of the measurement board 1. The number of the measurement board is printed on the back panel above the measurement connectors. The number of the channel is printed on the back panel next to the channel's measurement connector (see figure 2.8). Above each board's measurement connector there is a LED signal light which indicates the measurements of the board:

Measurement light is on	No measurement going on at the board
Measurement light is off	There is a measurement going on at some channel of the board

Installing the measurement cables

With standard measurement cables

The measurement cables available as ex-works delivery, VMP-1/2/5/10 (1, 2, 5 or 10 m) are installed into the measurement connectors of the supervision unit (see figure 2.8). Installation is easy to do without any tools because the cables are already terminated with plugs. In this case there is no possibility for incorrect connection.

In the installation it is recommended to avoid long draws near high current supply cables to minimize the coupling of the interference.

With instrumentation cable

Distance of the measurement point can be extended by using measuring cable VMPH-1 or VMPH-2 and shielded instrumentation cable (for example KLAM, NOMAK, REDAK, JAMAK) according to figure 2.9. The loop resistance of the instrumentation cable can be 3 Ω maximum.

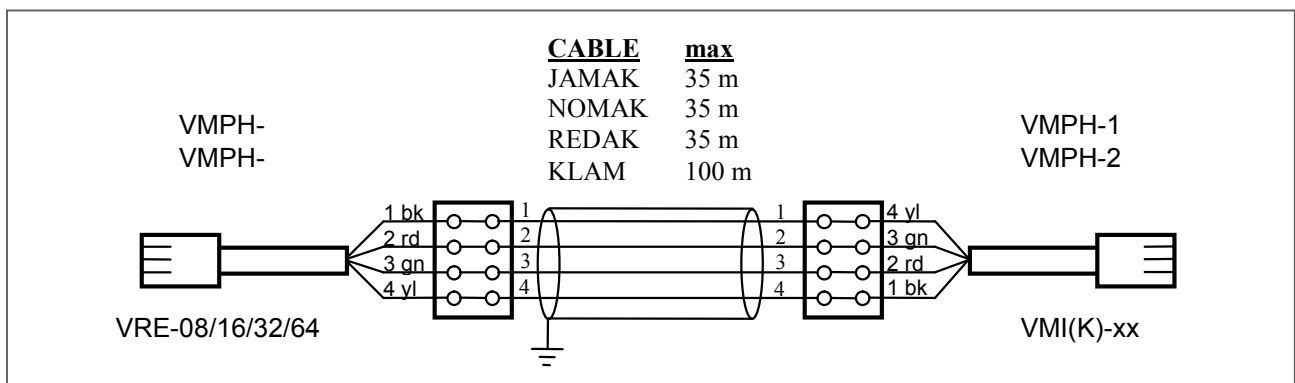


Figure 2.9. Connection of the measurement point with VMPH-1/2 measuring cable

NOTE! The changing of wire colours in the connectors

VMI(K)-25 sum current transformer installation

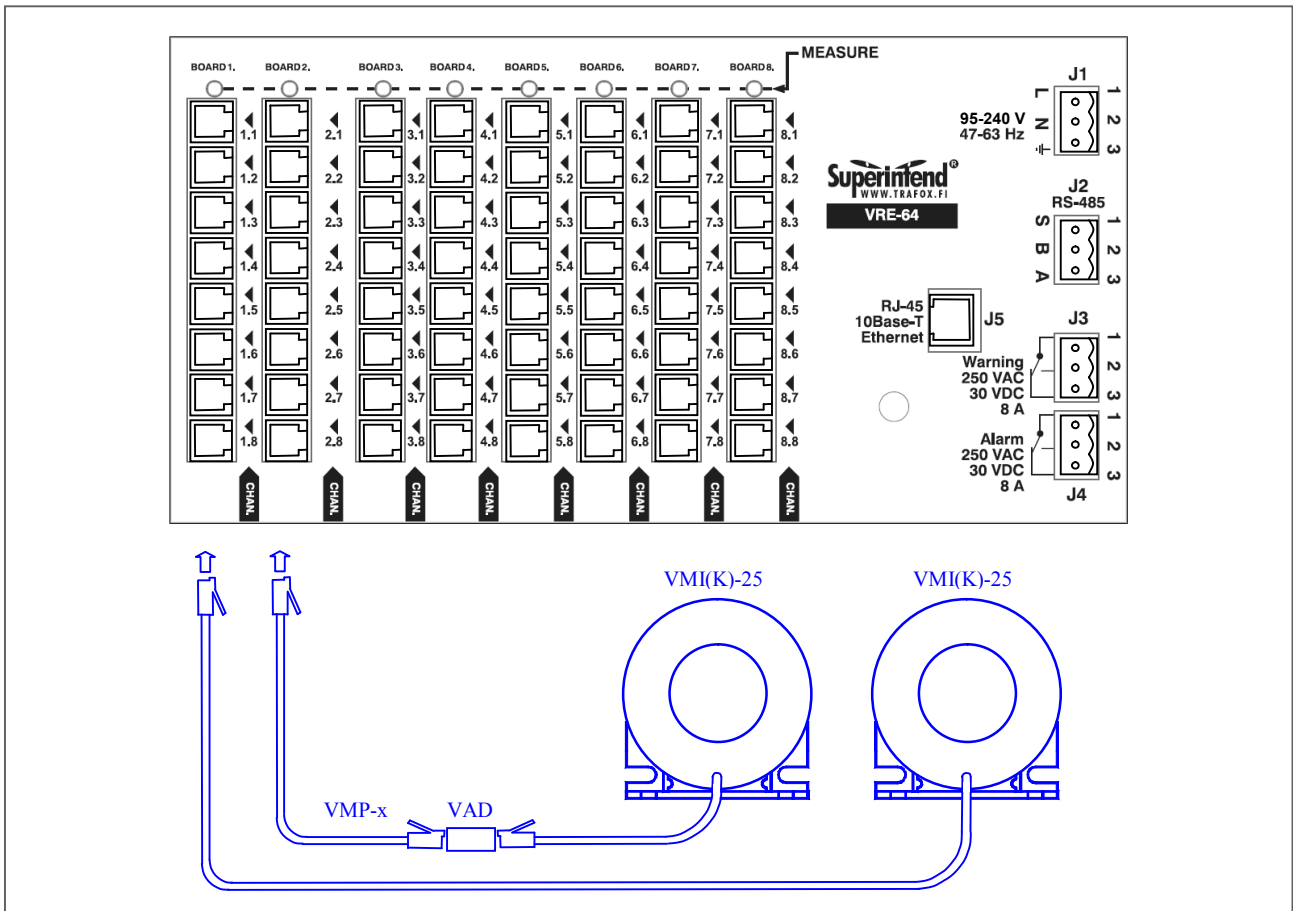


Figure 2.10. Connection of the VMI(K)-25 transformer directly and with an extended measurement cable

VMI(K)-25 sum current transformer is supplied with a fixed measurement cable. Cable can be extended by using a VAD adapter.

NOTE! Regular phone in-line connector will not work.

NOTE! Measurement cable must be installed first to the sum current transformer and after that to the fault current supervision unit.

2.2.4 CHECKING THE INSTALLATION

When the device is started for the first time after the delivery from the factory, the user language must be set (see chapter 3.1 Selecting the language).

It is essential to the perfect operation of the supervision that the cabling to the sum current transformer is done correctly. CPU is controlling also this, self testing for all channels is on by default. If needed, self testing can be deactivated per channel (see 3.7.1 Channel setup display). If the device detects a failure in cabling or in the operation of the CPU, a notification is given both with an alarm and by showing the failure on the display. A blinking F is shown in the channel's place (notification of equipment failure). For seeing a more specific explanation of the failure, it can be seen from the channel specific display of that specific channel (see 3.6 Channel specific display). The checking of the installation is done like this:

1. The channel specific display of the device is activated by pressing the button under the text "Select" twice and selecting the channel by pressing the arrow keys.

If the channel is functional there is a "CHANNEL OK" text shown in the channel specific display. If there is an error message "LOW TEST CURRENT" or "HI TEST CURRENT", checking has to be continued as stated in the paragraph 2.

2. To define the current level, press the button under the text "Options" to get to the additional menu of the channel.

In the additional menu of the channel on the row "TestCurr" can be seen the value of the test current obtained from the latest self test:

- Test current is correct when it's around 800-1200 mA.
- If the current value is below this, there can be a cable or connector failure and the device alerts about low test current ("LOW TEST CURRENT").
- If the current value is 900-11000 mA and the measured fault current level is lower in the channel, it can be assumed that the wiring of the cables has been done wrong.

The most typical failures

Typically the failure comes when terminal blocks and instrumentation cable are used. If a failure of high test current occurs (test current 9000-11000 mA) the measurement winding and the test winding have been swapped on the terminal block. When repairing, disconnect the device from the mains and rewire the measurement cabling. In case of terminal block connection the instructions for connecting can be found in the figure 2.9. In these cases it must be noticed that the measurement result is about four times bigger than the actual current level.

2.3 SUM CURRENT TRANSFORMERS VMI(K)-25/35/60/130/200

2.3.1 SELECTING THE PROPER CURRENT TRANSFORMER

The sum current transformers VMI(K) are used as measuring sensors in the system. Five different current transformers are available according to the inner diameter: 25, 35, 60, 130 and 200 mm. In addition all these sizes are available in two forms: split-core and closed core (see chapter 8 Sum current transformer dimensions). In order to achieve the best measuring accuracy it is always best to use a closed model, which has a slightly better immunity against external disturbances when compared with a split-core model.



Figure 2.11. Sum current transformer VMI(K)-25/35/60/130

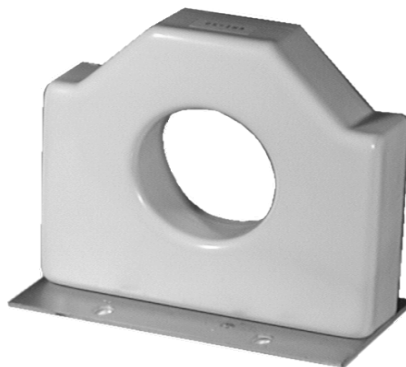


Figure 2.12. Sum current transformer VMI(K)-200

In addition, rectangular bus bar transformers VMIC(K) - XX x YY are available. The dimensions of the hole (horizontal XX and vertical YY) must be informed in millimetres.



Figure 2.13. Bus bar sum current transformer VMIC

Transformer size can be determined with the help of the next examples:

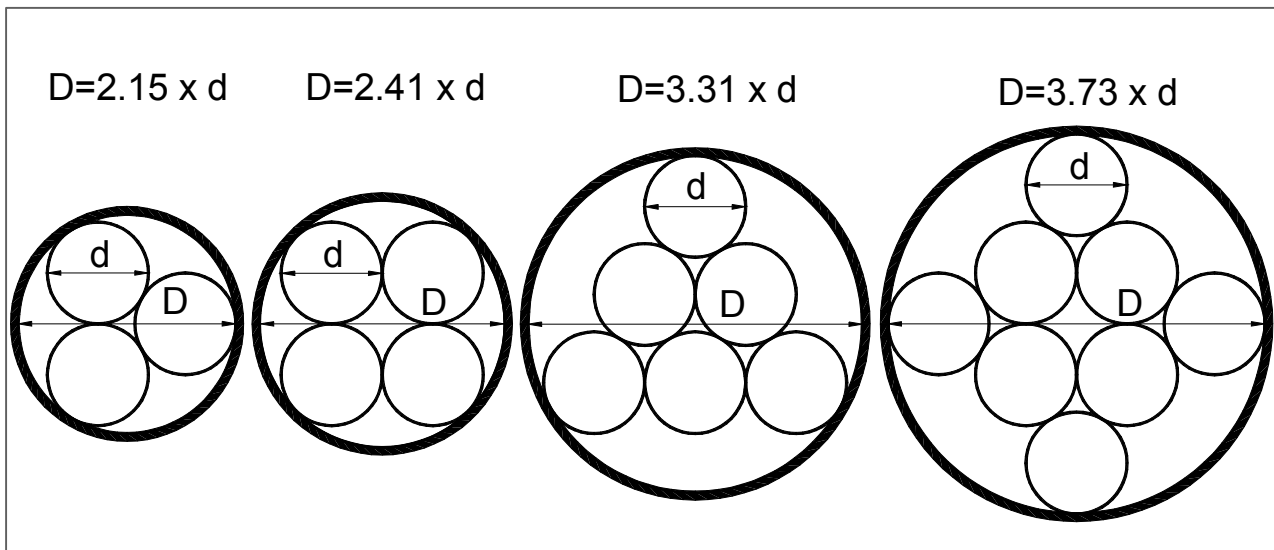


Figure 2.14. Calculating the needed diameter of the sum current transformer using the thickness of the wire

The symbols in the figure correspond dimensions::

d = outer diameter of cable with insulation

D = hole of the sum current transformer

* Add enough space to make it easier to draw cable through the hole of the transformer.

2.3.2 INSTALLING THE SUM CURRENT TRANSFORMER

Installation of a fixed sum current transformer is made prior installing the cables. Placing must be done carefully. **Don't place the transformer near a high current cable**, minimum distance is 100 mm. Transformers are fastened to their places. When cabling, the phase conductor (1-phase network) or the phase conductors (3-phase network L1, L2, L3) and the neutral conductor (N) are pulled through the sum current transformer according to figure 2.15.

Protective conductor is left outside the sum current transformer.

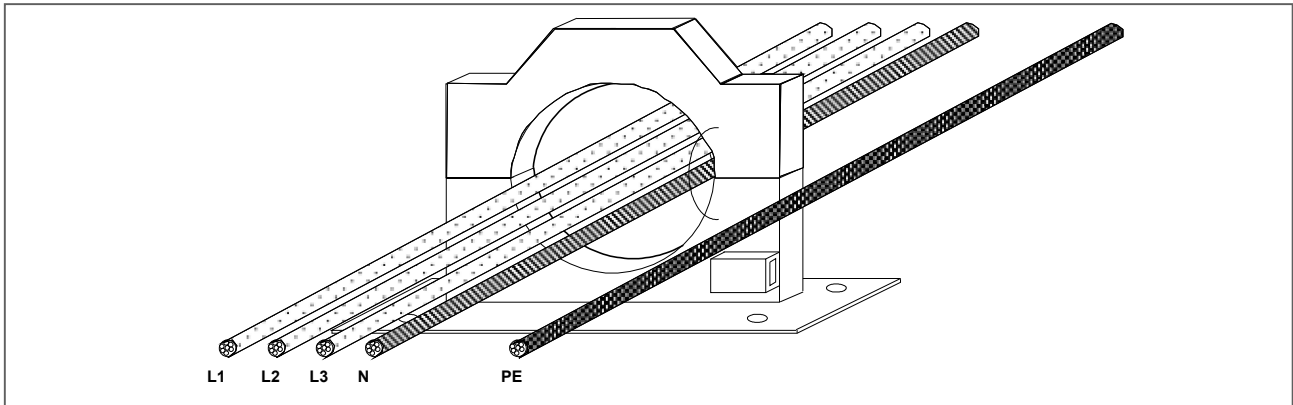


Figure 2.15. Installing the cables to the sum current transformer

2.3.3 INSTALLING THE SPLIT-CORE TRANSFORMERS

Current transformers are installed in the board by the bottom plate. After that the fastening screw is taken out according to figures 2.16, 2.17 and 2.18. It is easy to install the cables to an opened transformer.

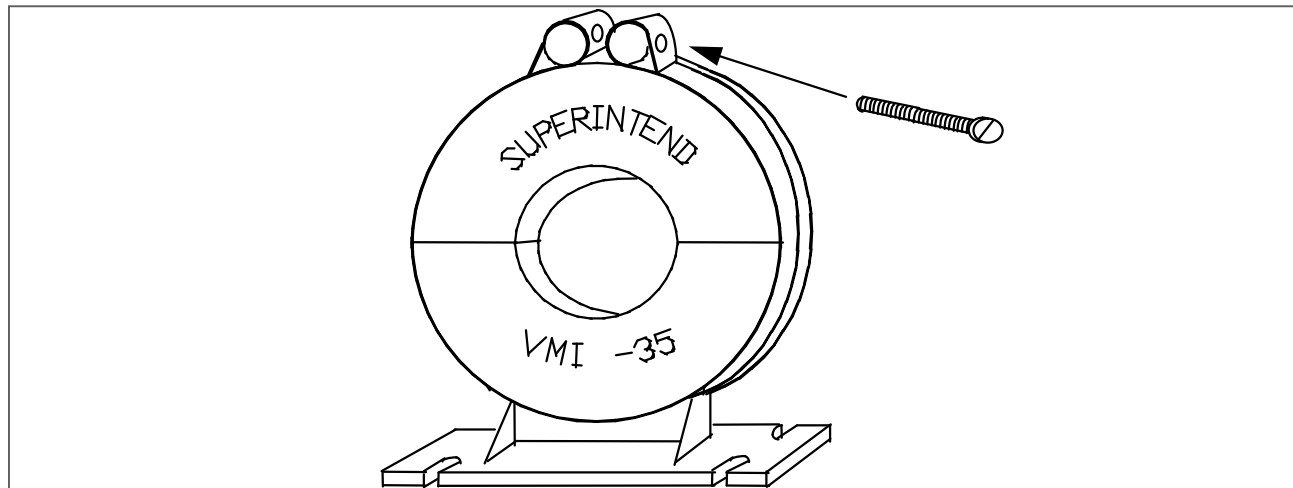


Figure 2.16. Sum current transformer VMIK-25/35/60

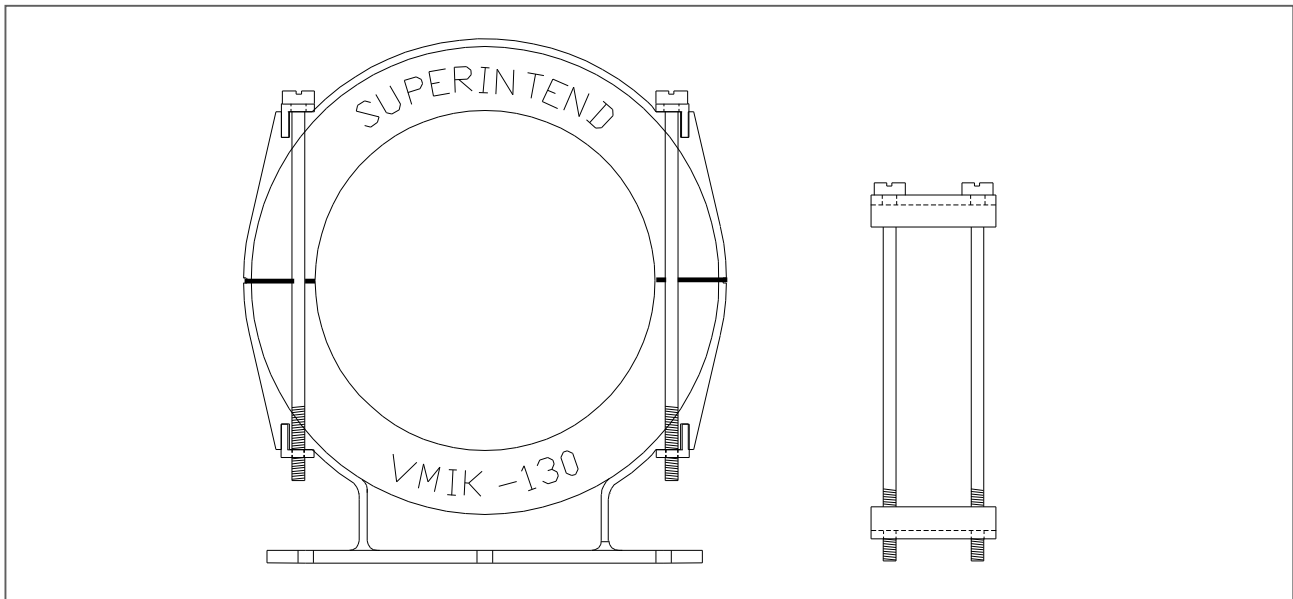


Figure 2.17. Sum current transformer VMIK-130 and the fixing parts for fastening the halves together

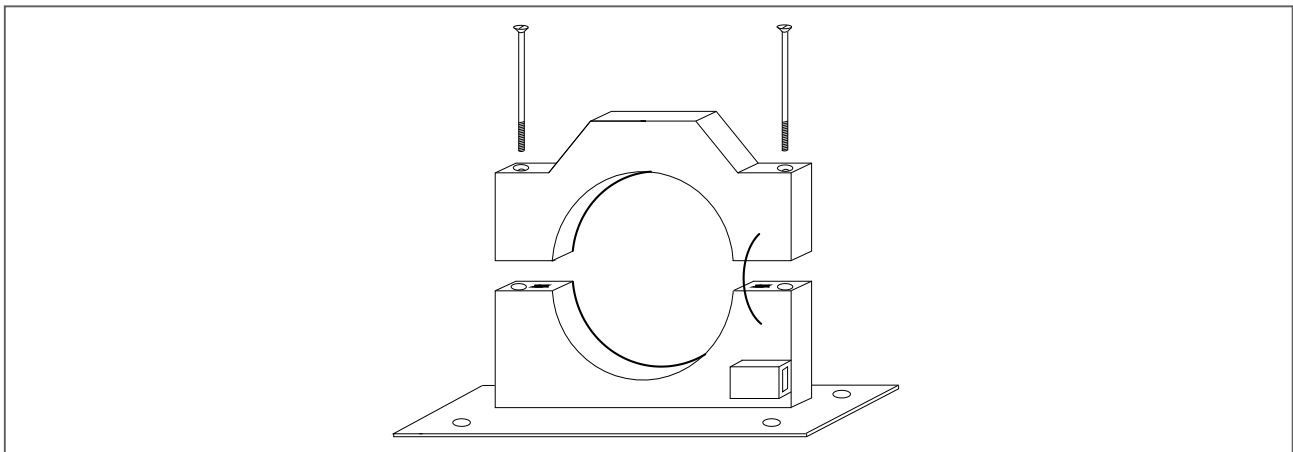


Figure 2.18. Sum current transformer VMIK-200

When the halves are again brought together, they have to be aligned carefully. After alignment the halves are tightened with a band tight enough, so that the accuracy would be as good as possible.

NOTE! VMIK sum current transformer shall not be carried by holding it by the cable loop and the other half of the transformer shall not hang when supported by the cable loop only. The cable loop shall not be exposed to mechanical forces – otherwise the transformer may be damaged.

2.3.4 SUM CURRENT TRANSFORMER INSTALLING, GENERAL

When installing a sum current transformer, the following facts must be taken into account:

1. Always select proper size sum current transformer. Too big a sum current transformer weakens the measuring accuracy.
2. Don't place the sum current transformer near cables, transformers, motors or other devices with high stray magnetic field. Place the sum current transformer in the distance of 50-100 mm from other cables with high current (>100A). This is important when measuring small leakage currents.

3. If the size of the transformer is big compared to the conductors going through it (Eg. High voltage cables) you should fasten conductors near center of the transformer. If necessary use insulation tubes. Dynamic forces caused by short circuit can break the sum current transformer.
4. Split core transformers. The cable or conductors must be always at the center of the transformer hole. Otherwise the current reading of the small earth leakage current is not correct.

2.4 STARTING UP THE SYSTEM

After completion of the installation the power can be connected. When the device is started for the first time after delivery from the factory, the language has to be set first (see chapter 3.1 Selecting the language).

The device initiates self test after it has started (see chapter 3.2 Start-up display). After self test the main display appears (see chapter 3.3 Main display) and the results of the self test are shown:

- Equipment failures occurred in the self test are shown in the grid with letter F. For troubleshooting the equipment failures see chapter 2.2.4 Checking the installation.
- Equipment faults occurred in the self test are shown below the channel grid with letter H. When the device is started, there occurs always one equipment fault: power fault.

Possible equipment failure alarms and equipment faults are acknowledged by pressing the OK button (see chapter 3.4 Alarm acknowledgement). After acknowledgement the relay pulls or goes to non-alarm state and the display state is returned to main display.

Equipment faults are described more specifically in the chapter 5.3 Equipment faults. If there occurs another equipment fault (letter H) after acknowledgement, power off the device and try to restart. If still some other fault than power fault occurs, contact the manufacturer (contact information: see chapter 6 Warranty).

3 DISPLAY

3.1 SELECTING THE LANGUAGE

User language is set when the device is started for the first time, or when the device is started after resetting to factory settings (see 3.8.7. Resetting to factory settings display)

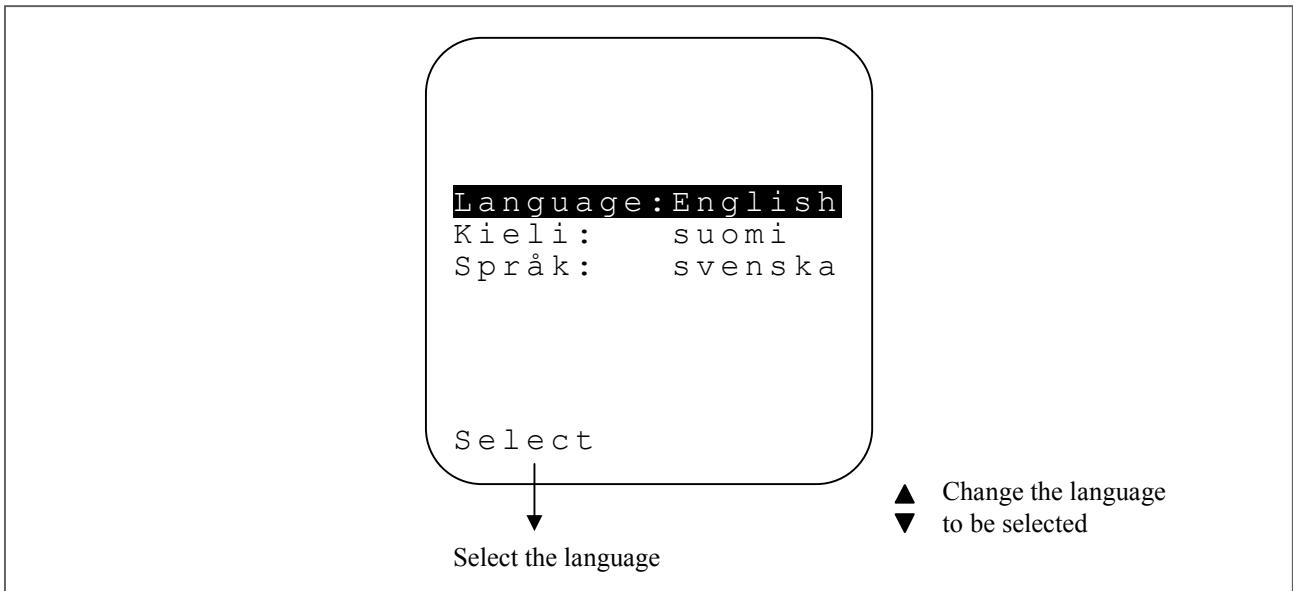


Figure 3.1. Setting the user language

The language is chosen by the vertical arrow keys and the selection is confirmed by pressing the left side key under the display. The device writes the settings to flash memory after the preferred language has been selected. During the flash writing there is a notice on the display:

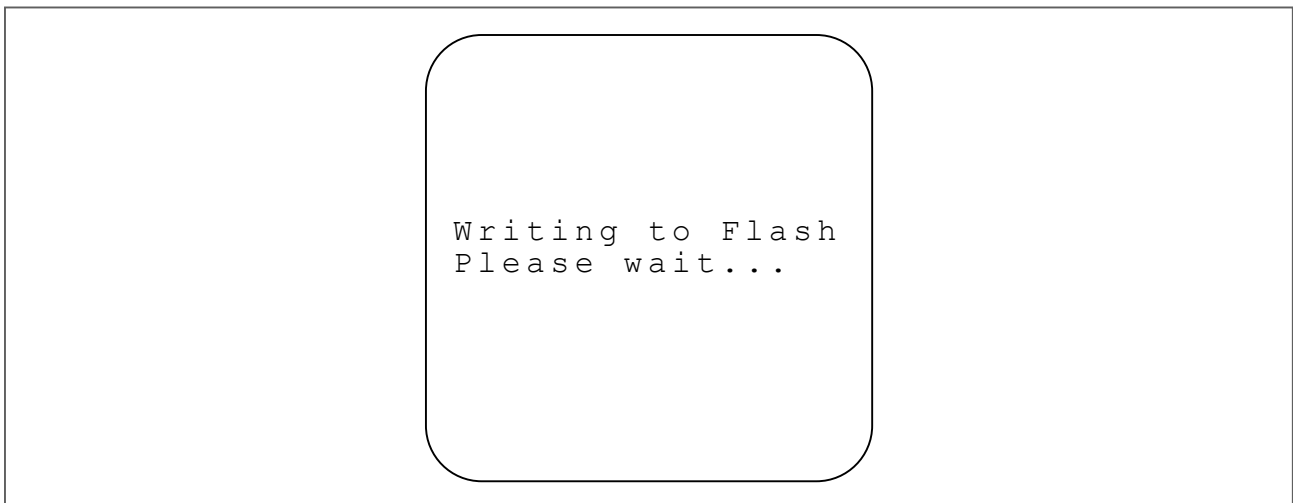


Figure 3.2. Flash writing of the language settings is in progress

NOTE! During Flash-writing it is absolutely prohibited to power down the unit. If the power is cut during the writing process, the memory can become corrupted.

If the language is set after start-up, the device shows the start-up screen after the settings have been written to memory (see 3.2 Start-up display)

If the language is set after resetting to factory settings, the device shows the results of reset after writing settings to memory.

Language settings can be changed later from the settings menu. (see 3.8.1 Device setup display).

3.2 START-UP DISPLAY

This is how the display looks like after starting up the device:



Figure 3.3. Start-up display

After starting the device goes through the self test sequence. During the test all critical components of all active channels are tested.

The progress of the self testing sequence can be seen on the display. It is shown by two horizontal bars:

- Upper bar indicates the test type. When the bars width is half of the screens width, the testing is being done to general components of the device. When the bar is in full length, testing is being done to measuring channels.
- Lower bar indicates the progress of channel testing. The wider the bar is, the bigger part of the active channels has been tested.

When the self test sequence has been finished, the device automatically goes to the main display mode.

3.3 MAIN DISPLAY

The main display looks like this:

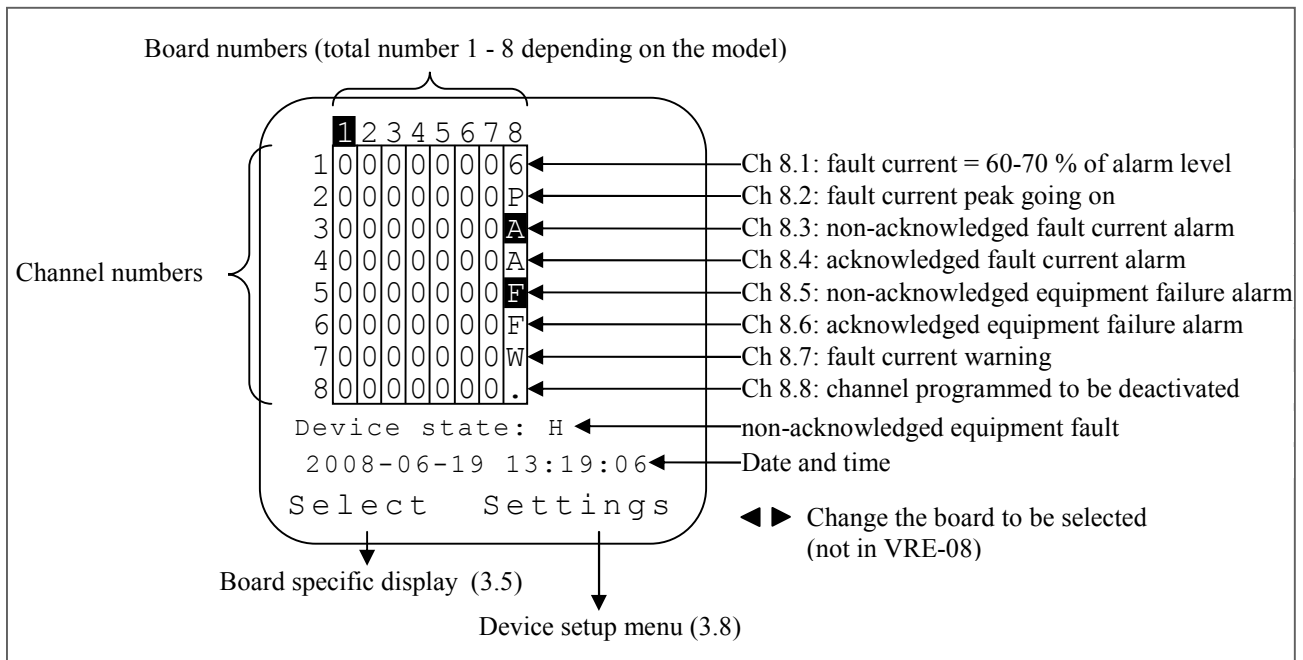


Figure 3.4. Main display

Main display is the general overview of the device. The states of all measurement channels and the test equipment can be seen.

The status information of the channels is shown on grid. Every vertical column corresponds one measurement card. Channel numbers can be seen on the horizontal rows of the grid. The number of the cards and the number of the columns in the grid are different in each device model:

VRE-08	1 board
VRE-16	2 boards
VRE-32	4 boards
VRE-64	8 boards

The numbering of the boards and channels in the grid display is similar to the numbering of the measurement cable connectors on the device's back panel (see 2.2.3 Electrical installation).

The state of every channel is told in the grid by one character:

0...9	The value of the fault current. Tens of percents of the alarm limit. For example in channel 8.1 number "6" means that the measured current is 60-70 % of the alarm limit. There is no special situation going on that channel.
P	There was a current peak in the supervision point: the alarm level was exceeded for less than the set period but no over-current alarm was generated
A	Non-acknowledged (blinking "A") or acknowledged (non-blinking "A") fault current alarm on the channel. Character disappears after the alarm has been acknowledged and the current has decreased under the alarm limit.
F	Non-acknowledged (blinking "F") or acknowledged (non-blinking "F") equipment failure alarm. Character disappears when the equipment fault alarm has been acknowledged and self testing confirms that the failure has been repaired.

- W Fault current warning on channel. Fault current is above the specified warning limit, but below the specified alarm limit. Indicator disappears when the current has decreased below the warning limit.
- Channel is programmed to be deactivated.

In case that there are multiple situations going on a channel, the information on the grid is shown based on the next table. The uppermost row has the highest priority and the lowermost row has the lowest priority:

Channel is programmed to be deactivated
Fault current peak
Non-acknowledged fault current alarm
Acknowledged fault current alarm
Non-acknowledged equipment failure alarm
Acknowledged equipment failure alarm
Fault current warning

The state of the device is shown below the grid:

- OK No non-acknowledged equipment faults
- H At least one non-acknowledged equipment fault. If some of these faults is of alarm causing type (other than fault caused by a voltage cut), the symbol is a blinking "H".

Time of the internal clock is shown below the device state. Clock has a backup battery, so it keeps on running also when there is no supply voltage available. Time can be changed in the setup menu (see 3.8.1 Device setup display).

The measurement board is selected from the main menu by pressing the horizontal arrow buttons. The selection is confirmed by pressing the button below the text "Select". This is how to get to the board-specific display mode. Note that model VRE-08 has only one measurement board, so the selection procedure does not apply to that model.

From the main menu it is also possible to get to the setup menu by pressing the "Settings" button.

3.4 ALARM ACKNOWLEDGEMENT

VRE-08/16/32/64 devices generate alarms in certain situations. Please refer to chapter 5 Alarms for more information. There are two main types of alarms: channel alarms and equipment faults.

Channel alarms are divided into fault current alarms and equipment failure alarms that are found in the self test procedure. Equipment failure alarms are divided to low test current alarms and high test current alarms. The cause for a low test current alarm is a connection failure between the VRE device and sum current transformer. Typically the failure is caused by cabling or connectors. The cause for a high test current alarm is the cross-connection of the measurement winding and test winding. This is a typical failure when using terminal blocks and instrumentation cable. The cross-connection is probably made at the terminal block.

Equipment faults are divided into those which are caused by voltage breaks and other ones.

Alarm acknowledgement is made by pressing the OK button. Regardless of in which display state the device is, the pressing of the OK button affects the display as follows:

- if there are non-acknowledged channel alarms, the acknowledgement display of the first non-acknowledged alarm is shown.
- if there are no non-acknowledged channel alarms but there are non-acknowledged equipment faults, then the acknowledgement display of the first non-acknowledged equipment fault is shown.
- if there are no non-acknowledged channel alarms or non-acknowledged equipment faults, then the Information display is shown.

3.4.1 ACKNOWLEDGEMENT DISPLAY OF THE CHANNEL ALARM

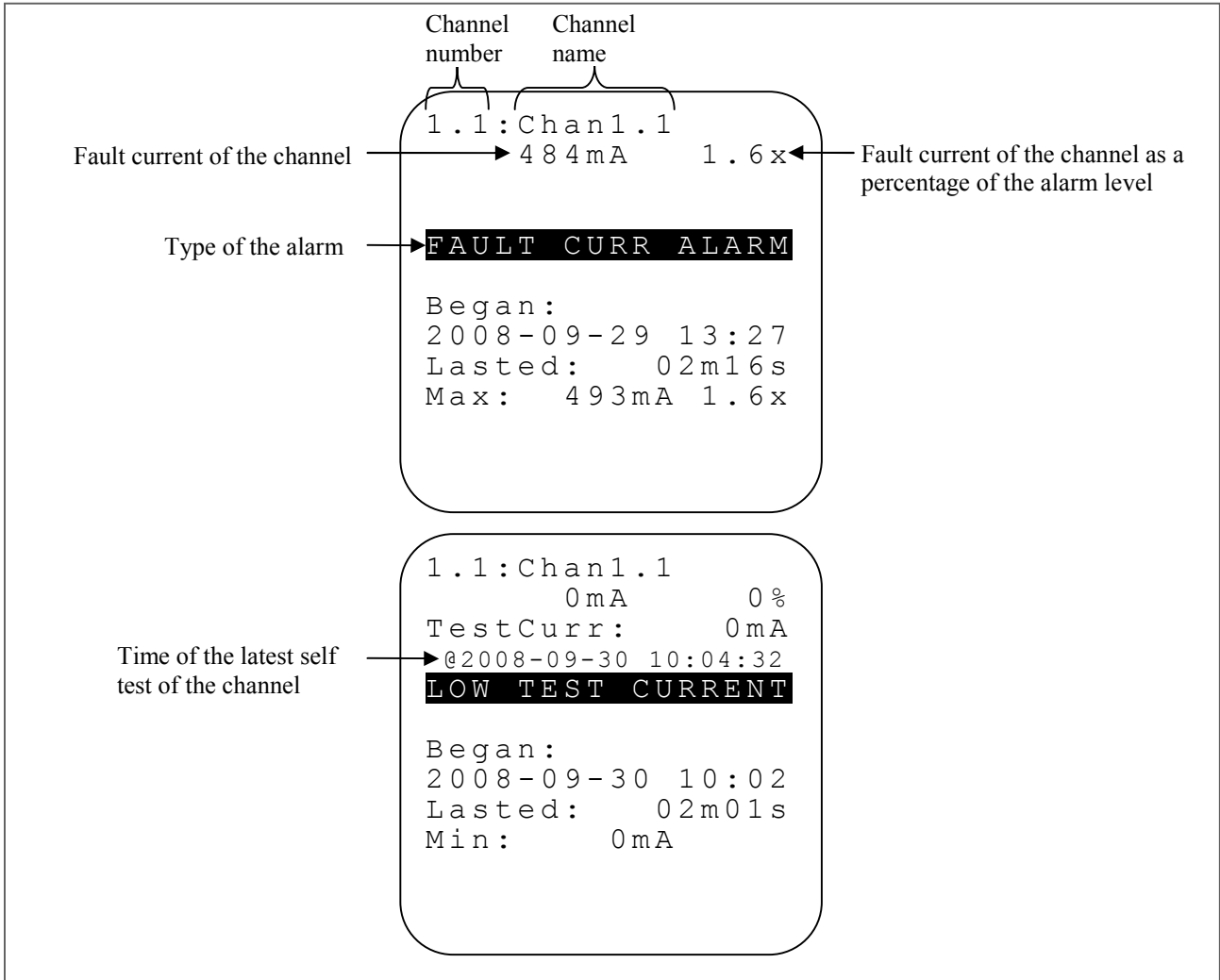


Figure 3.5. Acknowledgement display of the channel alarm

Channel's number and name are shown on the first row. On the second row there is the channel's fault current and its ratio to the alarm limit

In case of low and high test current the last measured current value from the self test is shown next. Below the test current value can be seen the date and time when the result has occurred.

Below this information the alarm type is written in capital letters. The text is flashing if the alarm has not been acknowledged.

The beginning time of the alarm is told below the alarm type. Duration is told under the beginning time. If the alarm has lasted less than one hour, the duration time is shown in minutes and seconds. In other cases the duration is shown in hours and minutes (and days if the duration is more than one day). If the duration is over 100 days, the screen shows ">100d".

The duration time is calculated from the moment of beginning to the moment when the fault current has dropped below the alarm level. In case of low and high test current, the beginning time will be the time of the self test which has detected the failure for the first time. Duration time is calculated from the beginning time to the last self test time when the failure has still been active.

The biggest fault current measured during the alarm is shown below the time information. In case of a low test current the smallest measured test current value from the self test during the equipment failure alarm is being shown. In case of a high test current the biggest measured test current value from the self test during the equipment failure alarm is being shown.

The alarms on the display are acknowledged by pressing the OK button. After acknowledgement the device goes to a different display mode as follows:

- if there are more non-acknowledged channel alarms, the acknowledgement screen of the next non-acknowledged alarm is shown.
- if there are no non-acknowledged channel alarms but there are some non-acknowledged equipment faults, the acknowledgement display of the next non-acknowledged equipment fault is being shown.
- if there are no any non-acknowledged alarms whatsoever the display is returned to the state it was before the OK button was pressed for the first time.

3.4.2 ACKNOWLEDGEMENT DISPLAY FOR EQUIPMENT FAULT

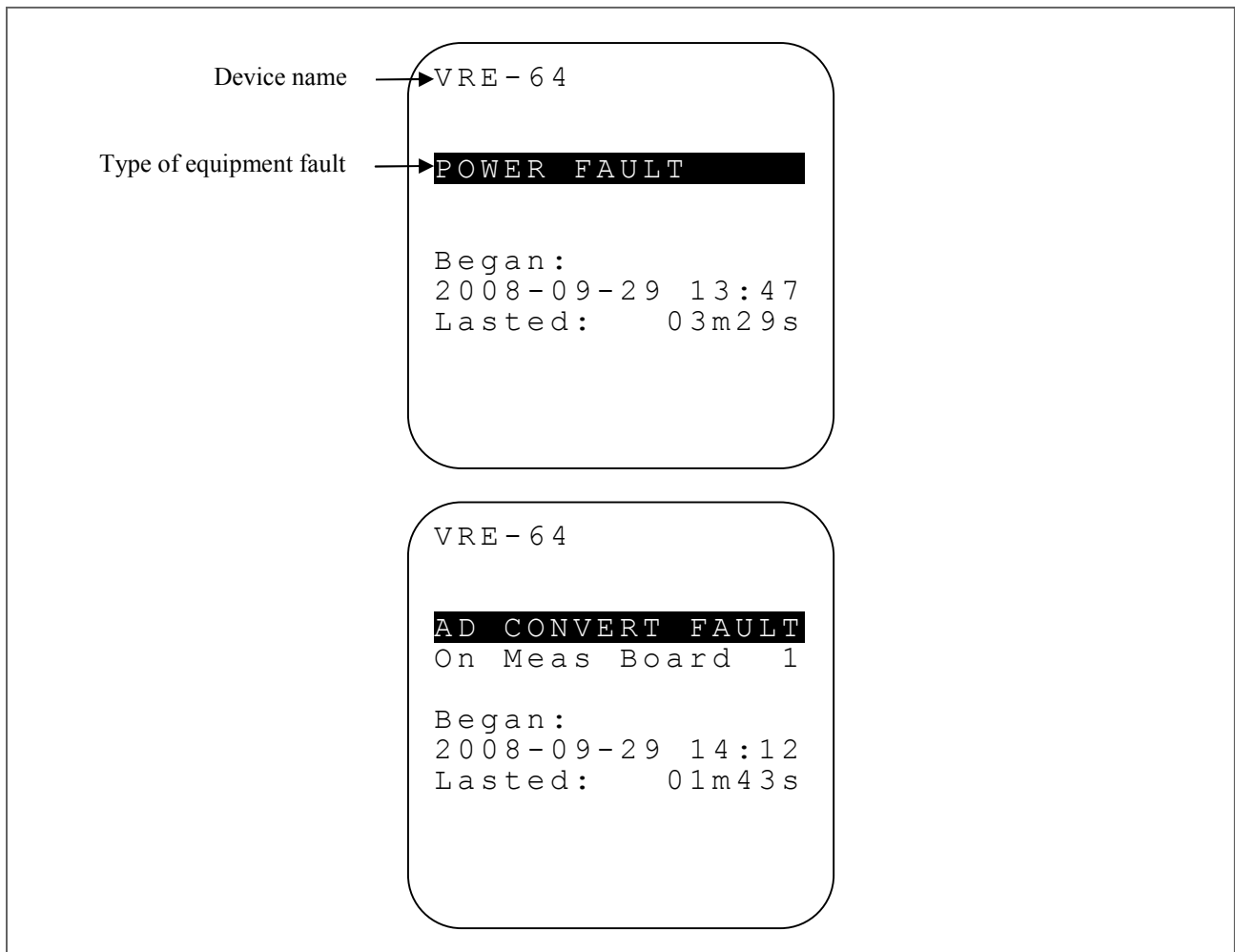


Figure 3.6. Acknowledgement display for equipment fault

The device name is shown on the first row. On the next row the fault type is written in capital letters. If the alarm has not been acknowledged the text is flashing. The number of the measurement board is shown if the fault is related to measuring procedure. The start time and duration are shown last on the screen.

Equipment fault on the screen is acknowledged by pressing the OK-button. After the acknowledgement the display goes to another state as follows:

- if there are non-acknowledged channel alarms, the acknowledgement display of the first non-acknowledged alarm is shown.
- if there are no non-acknowledged channel alarms but there still are non-acknowledged equipment faults, the acknowledgement display of the next non-acknowledged equipment fault is shown.
- if there are no non-acknowledged alarms whatsoever the display is returned to the state it was before the OK-button was pressed for the first time.

3.5 BOARD SPECIFIC DISPLAY

The state of one measurement board is shown on the board specific display. The information is more specific than in the main display:

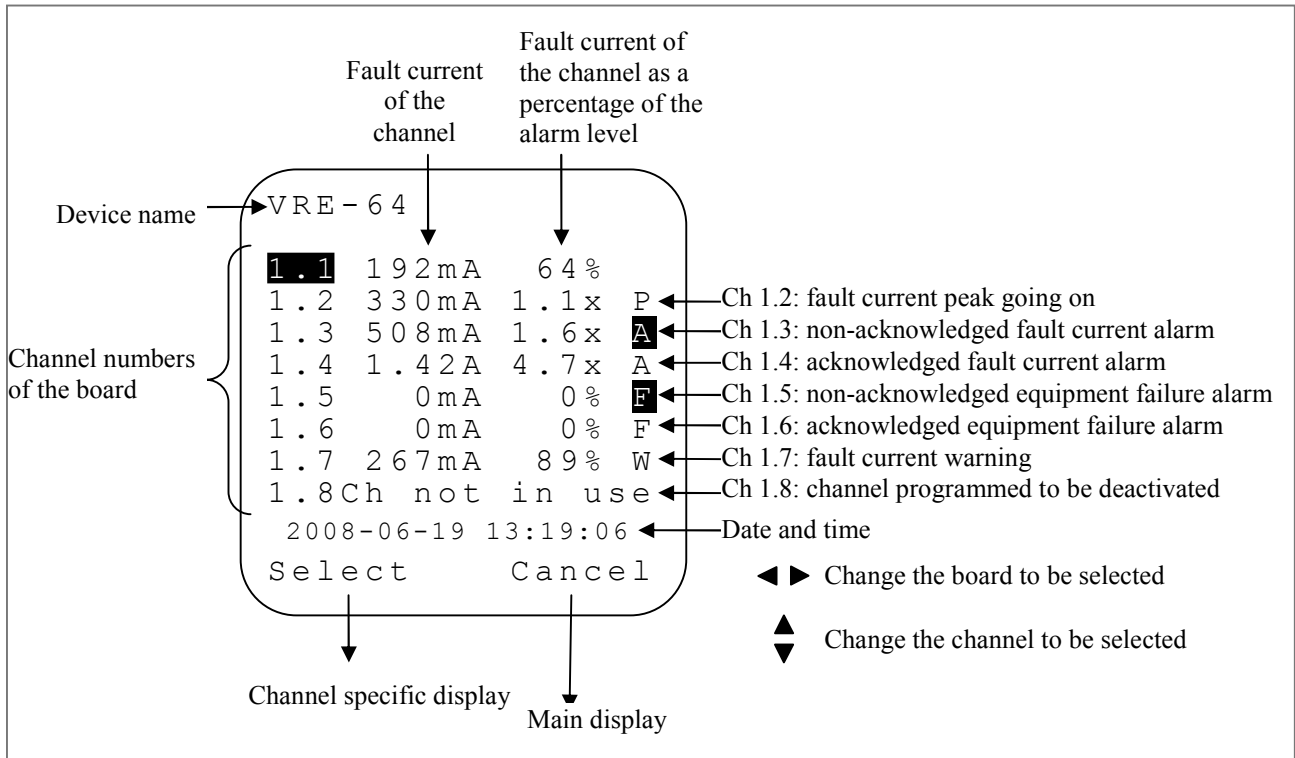


Figure 3.7. Board specific display

The name of the device is shown on the top row. The name can be changed in the setup menu.

All the channels of the measurement boards are shown below each other on the display. The channel number is shown first for every channel. This number consists of the measurement board number and the channels number inside the board. For example channel 1.6 means the channel 6 of measurement board 1.

After the channel number the fault current and percentage of the alarm level are shown. If the fault current is below the alarm limit, the ratio is shown in percents. If the fault current is above the alarm limit, the ratio is shown as multiplier. For example 4.7x means that the measured current is 4,7 times the alarm limit.

Last character tells the alarm or other situation going on that channel. If there is nothing special going on in a channel, the character is left empty. The character is determined in the same way than on the main display:

- P There was a current peak in the supervision point: the alarm level was exceeded for less than the set period but no over-current alarm was generated
- A Non-acknowledged (blinking "A") or acknowledged (non-blinking "A") fault current alarm on channel. Indicator disappears after the alarm has been acknowledged and the current has decreased under the alarm limit.
- F Non-acknowledged (blinking "F") or acknowledged (non-blinking "F") equipment failure alarm. Indicator disappears when the equipment fault alarm has been acknowledged and self testing confirms that the failure has been repaired.
- W Fault current warning on channel. Fault current is above the specified warning limit, but below the specified alarm limit. Indicator disappears when the current has decreased below the warning limit.

If some channel of the board has been programmed to be deactivated, then there is only shown the channel's number and a text "Chan not in use".

In case that there are multiple situations going on a channel, the information is shown based on next table. The uppermost row has the highest priority and the lowermost row has the lowest priority:

Channel is programmed to be deactivated
Fault current peak
Non-acknowledged fault current alarm
Acknowledged fault current alarm
Non-acknowledged equipment failure alarm
Acknowledged equipment failure alarm
Fault current warning

The device's name is shown on the top row and below the channels information the date and time are shown.

It is possible to see the channel-specific display by following the next procedure. First the channel is selected by pressing the vertical arrow keys. The selection is confirmed by pressing the "Select" button.

The measurement board can be selected by pressing the horizontal arrow keys. This does not apply to VRE-08, as that model has only one measurement board.

It is possible to be returned to the main display by pressing the "Cancel" button.

3.6 CHANNEL SPECIFIC DISPLAY

One channel's status is shown on the channel specific display:

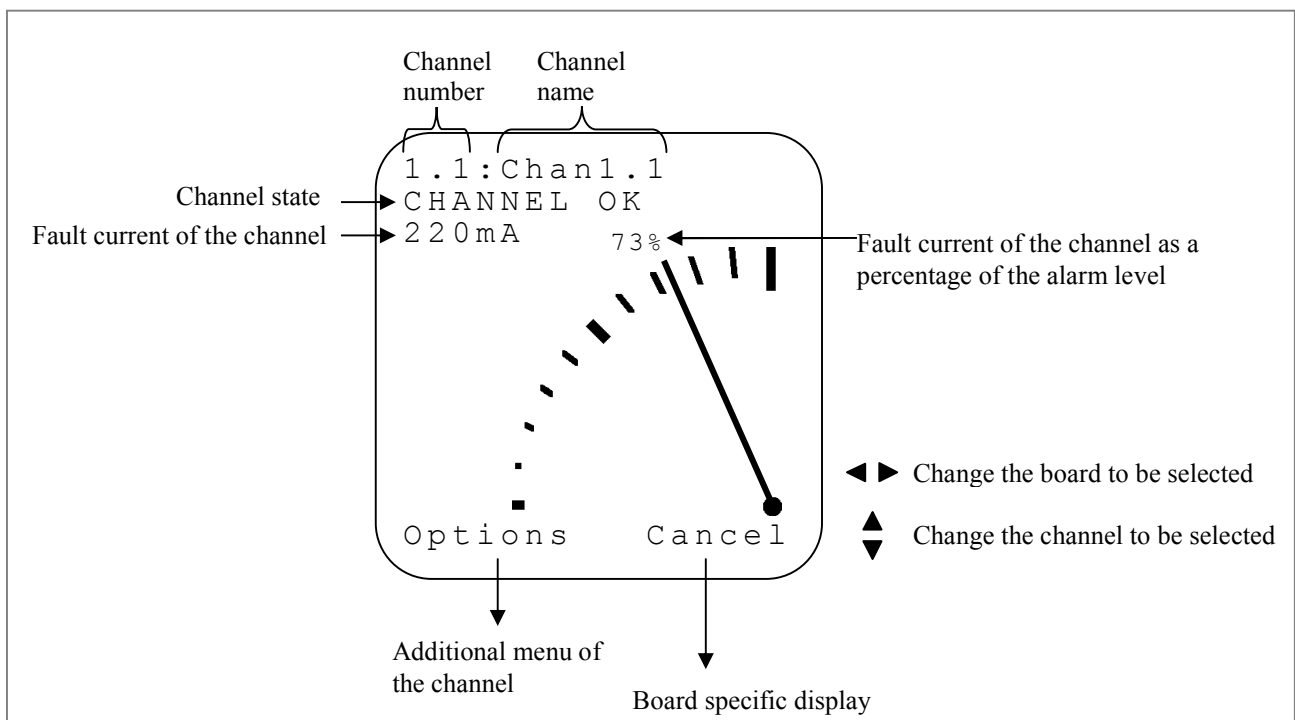


Figure 3.8. Channel specific display

The channel's number and name is being shown on the top row. The name of the channel can be changed from the setup menu.

The channel's status is shown on the second row. These are the possible status:

CHANNEL OK	There is no special situation going on this channel.
PEAK FAULT CURR	There was a current peak in the supervision point: the alarm level was exceeded for less than the set period but no over-current alarm was generated
FAULT CURR ALARM	Non-acknowledged (blinking text) or acknowledged (non-blinking text) fault current alarm on channel. The text disappears when the alarm has been acknowledged and the fault current has decreased under the alarm limit.
HI TEST CURRENT	Non-acknowledged (blinking text) or acknowledged (non-blinking text) equipment failure alarm on channel. This is caused by too high test current measured in the self test. The text disappears when the alarm has been acknowledged and self testing confirms that the failure has been repaired.
LOW TEST CURRENT	Non-acknowledged (blinking text) or acknowledged (non-blinking text) equipment failure alarm on channel. This is caused by too low test current measured in the self test. The text disappears when the alarm has been acknowledged and self testing confirms that the failure has been repaired.
FAULT CURR WARN	Fault current warning on channel. The fault current is bigger than the set warning limit but smaller than the set alarm limit. The text disappears when the fault current has decreased under the warning limit.

In case that there are multiple situations going on a channel, the information is shown based on next table. The uppermost row has the highest priority and the lowermost row has the lowest priority:

Channel is programmed to be deactivated
Fault current peak
Non-acknowledged fault current alarm
Acknowledged fault current alarm
Non-acknowledged high current equipment failure
Acknowledged high current equipment failure
Non-acknowledged low current equipment failure
Acknowledged low current equipment failure
Fault current warning
Channel OK

The channel's fault current value is shown under the status text if the channel has not been disabled.

Fault current's percentage of the channel's alarm limit is shown on a virtual analog meter. The needle position shows the fault current's percentage of the alarm limit when the fault current is under the alarm limit. Horizontal needle position corresponds 0% current and vertical needle position corresponds 100% current. The current percentage is shown also by numbers next to the needle tip. The needle stays at the vertical position when the fault current rises over the alarm level. Fault current's ratio to the alarm level is also shown above the needle.

The channel to be viewed can be changed on the channel specific display. The vertical arrow keys are used to switch between the channels of one measurement board. The measurement board can be selected and changed by pressing the horizontal arrow keys. Please note, that the VRE-08 has only one measurement board.

Additional menu of the channel can be accessed by pressing the "Select" key.

By pressing "Cancel" key it is possible to return to the board specific display from the channel-specific display.

3.7 ADDITIONAL MENU OF THE CHANNEL

All the most important channel settings and channel status is shown in the additional channel menu. It is also possible to get to the settings display and statistics display from this menu.

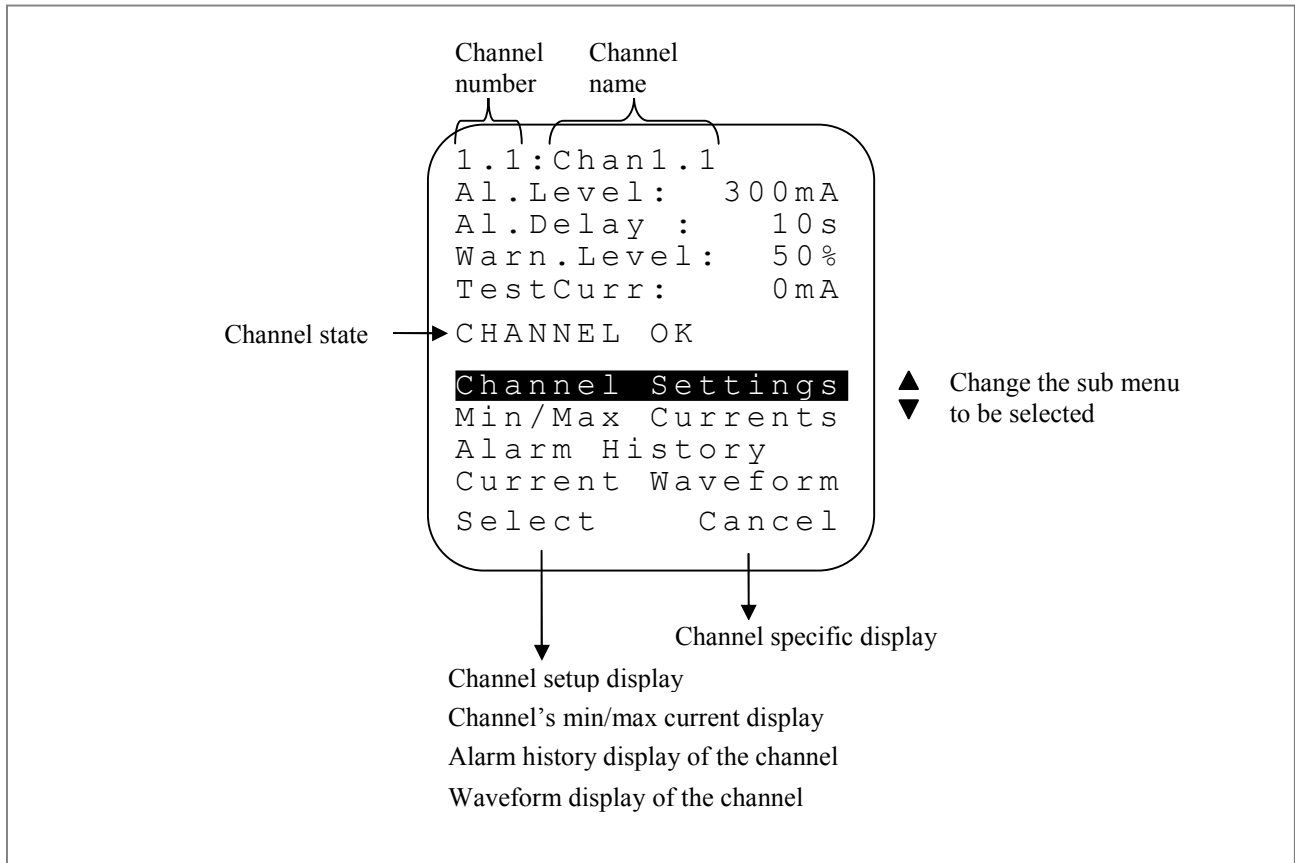


Figure 3.9. Additional menu of the channel

The channel's name and number is shown on the top row of the menu. The channel's name can be changed in the settings display.

The set alarm limit is shown on the second row. The alarm delay is shown on the third row. Alarm limit is shown on the fourth row if the fault current warning is enabled for the channel. Otherwise the fourth row is empty.

Test current value from the self test is shown on the fifth row if the self test is enabled for the channel.

The channel's status information is shown under the settings information. Status row is similar to the status row on the channel specific display.

Selection for the sub menu can be made below the status information. The vertical keys are used to select the desired sub menu. The selection is confirmed by pressing the "Select" key.

By pressing "Cancel" key it is possible to return to the channel specific display from the sub menu.

3.7.1 CHANNEL SETUP DISPLAY

Channel settings can be changed from the following menu:

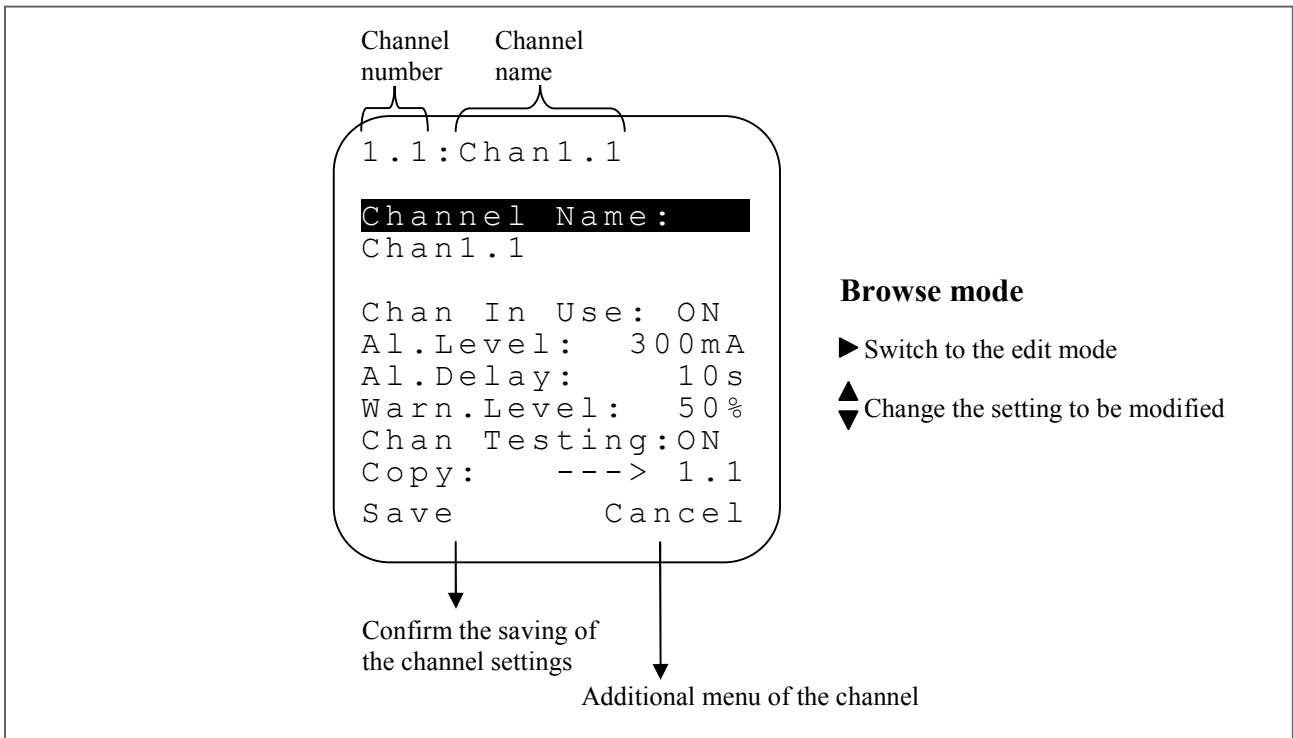


Figure 3.10. Channel setup display in the browse mode

Channel's number and previously saved name are shown on the first row. The changeable channel settings are next.

This display has two modes: browse mode and edit mode. The setting to be modified is selected by pressing the vertical arrow keys in the browse mode. The selected setting is highlighted on the screen. The selected setting can be modified by pressing the right arrow key. Edit mode will be engaged:

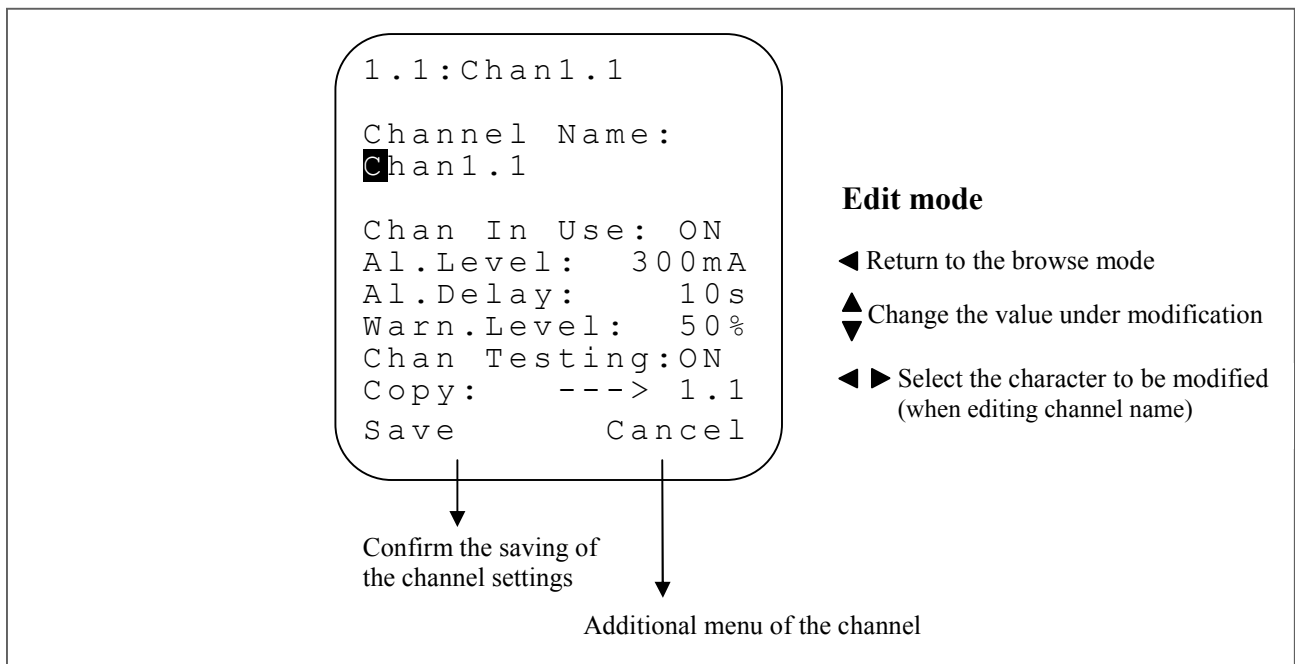


Figure 3.11. Channel setup display in the edit mode

The value to be modified is highlighted in the edit mode. The value can be changed by pressing the vertical arrow keys. It is possible to return back to the browse mode by pressing the left arrow key.

The name of the channel is modified by one character at a time. The character to be modified is selected by pressing the horizontal arrow keys. Maximum length for the channel name is 12 characters. It is possible to return to the browse mode by pressing the left arrow key when the cursor is on the first character. The next characters are allowed to be used in the name:

space ! " # \$ % & ' () * + , - . / 0 ... 9 : ; < = > ? @ A ... Z [\] ^ _ ` a ... z { | } ~

Other settings available for channel are:

Setting	Possible values	Default	Description
Chan In Use	ON OFF	ON	Channel can be deactivated with this
Al. Level	5 – 999 mA (1 mA steps) 1 – 10 A (0,01 A steps)	300 mA	Look below
Al. Delay	0 – 95 s (1 s steps)	10 s	Look below
Warn. Level	OFF (0 %) 1 – 100 % (1 % steps)	OFF	Percentage of the alarm level. Look below for more information.
Chan Testing	ON OFF	ON	This setting specifies if the channel is present in the regular self test procedure. Look below for more information.

The operation of the fault current alarm is affected by the alarm level and the alarm delay. Channel goes to current peak mode when the current rises above the alarm level. The channel's status will be updated to fault current alarm if the current stays above the alarm level for the specified delay time. Fault current alarm will be immediate after the current has risen over the alarm limit if the alarm delay has been set to 0 s.

It is also possible to use fault current warning. Warning level is set to be percentage of the alarm level. This means that warning level cannot be greater than alarm level. The warning system initiates a warning when the fault current rises above the set warning level. The warning disappears when the current has decreased below the warning level.

The device inspects the measuring chain of every channel in one minute intervals. Any failures detected in this inspection result to an equipment failure alarm (see section 5.1.2 Self test and equipment failure alarms). The failure is shown as letter F in the channel's status information. When performing inspection to the measuring chain it is required

that the sum current transformers are connected either with stock cable or with instrumentation cable so that all four wires of the transformer are connected (see section 2.2.3 Electrical installation). If necessary it is also possible to connect each sum current transformer by using two wires. It is however impossible to use this kind of connection with the automatic measuring chain inspection. This kind of connection results to incorrect equipment failure alarms on channel. The channel's self testing must be disabled if this kind of connection is used in some channel.

The settings of the channel can be saved by pressing the "Save" button. It must be confirmed one more time if the settings are really wanted to be saved:

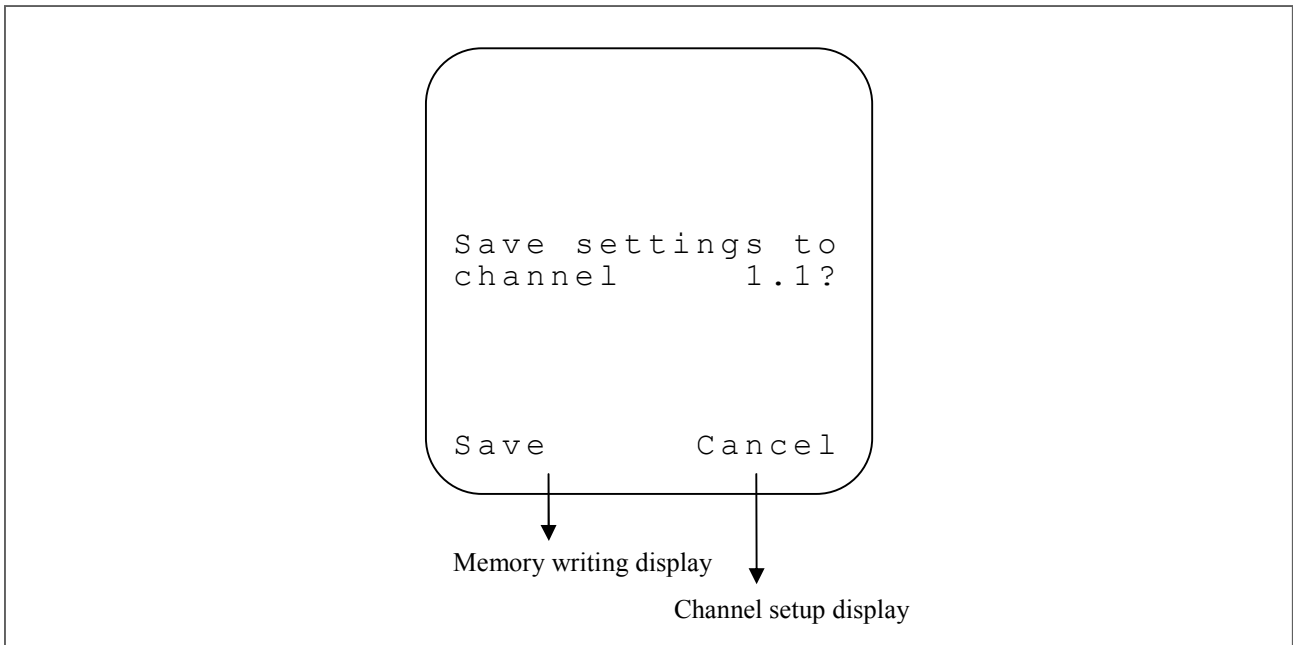


Figure 3.12. Confirmation of the saving of the channel settings

The saving of the settings can be cancelled by pressing the "Cancel" button. The device returns to the settings display, where the setting values are same than before pressing the "Save" button.

If the saving is confirmed the device writes the settings to Flash memory. During the flash-writing there is a note shown on the screen:



Figure 3.13. Writing channel settings to the Flash memory going on

NOTE! During Flash-writing it is absolutely prohibited to power down the unit. If the power is cut during the writing process, the memory can become corrupted.

Result of the writing is shown after the flash-writing is finished:

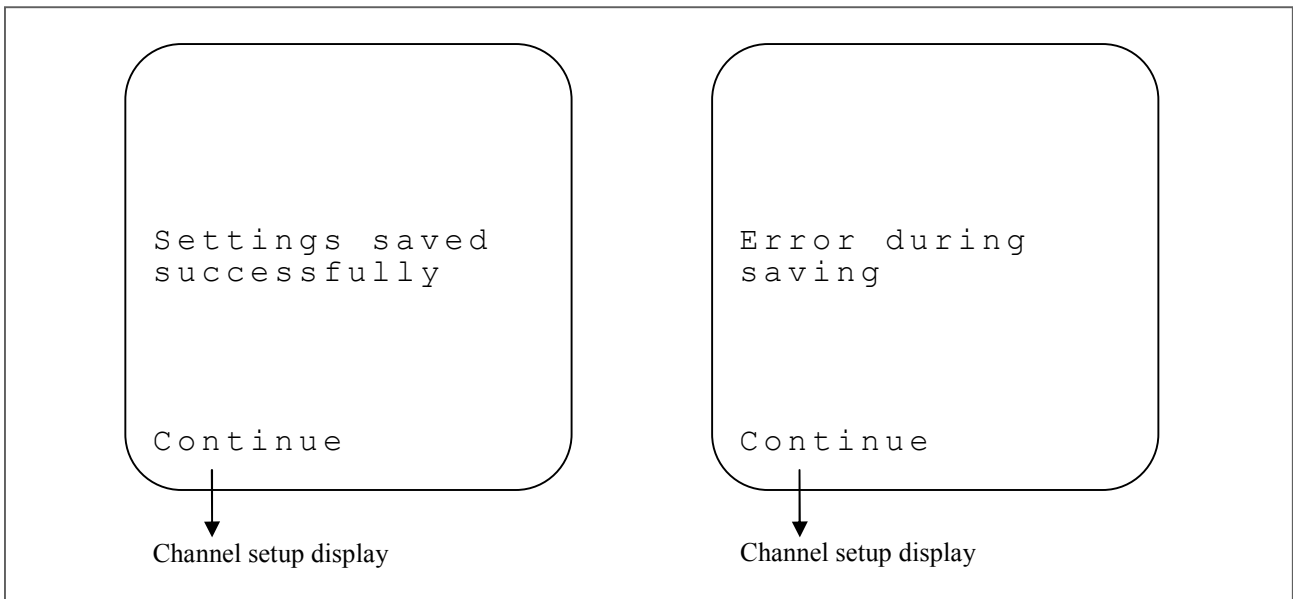


Figure 3.14. Result displays of writing the channel settings to the memory

Result display tells when the settings are saved to Flash memory. An error message will be shown if the writing procedure fails. By pressing the “Continue” button the device is returned to the channel’s setting display.

Settings can be also copied to another channel:

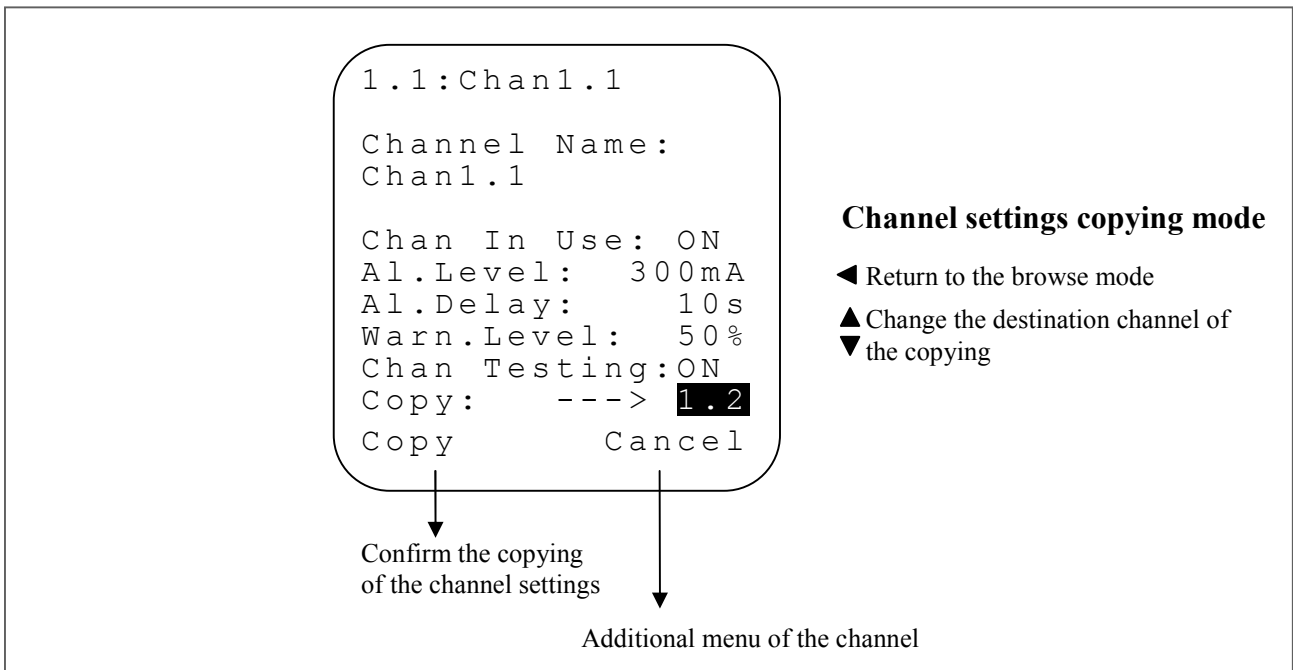


Figure 3.15. Channel setup display in the copy mode

The copying mode can be activated by selecting the ”Copy” row on the screen and activating the edit mode. In the edit mode the destination channel is selected by pressing the vertical arrow keys.

Confirmation message appears on the screen after pressing the “Copy” button:

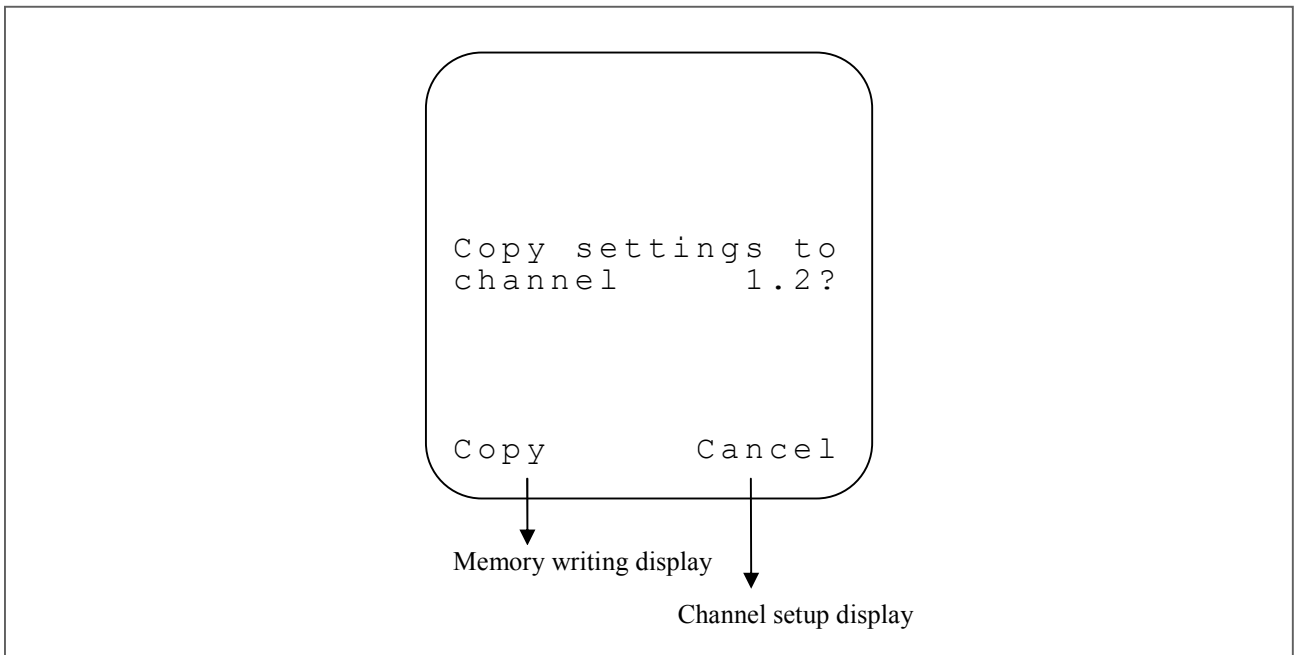


Figure 3.16. Confirmation of the copying of the channel settings

Copying can be cancelled by pressing the "Cancel" button. If the procedure is cancelled the device goes back to the setup display and copying mode. All the settings are like they were before pressing the "Copy" button.

The device copies the settings to the selected destination channel if the copy process is confirmed. The settings are written to the Flash memory. From now on the process goes onwards just like in normal Flash-writing of the settings. Information screen is visible during the Flash-writing. Result screen appears after the writing procedure has finished. By pressing "Continue" button in the result screen the device is returned to the channel's setting screen.

NOTE! During Flash-writing it is absolutely prohibited to power down the unit. If the power is cut during the writing process, the memory can become corrupted.

By pressing the "Cancel" button it is possible to return to the channel's additional menu from the channel's settings display

3.7.2 CHANNEL'S MIN/MAX CURRENT DISPLAY

Statistical values of the channel can be inspected on the min/max current display:

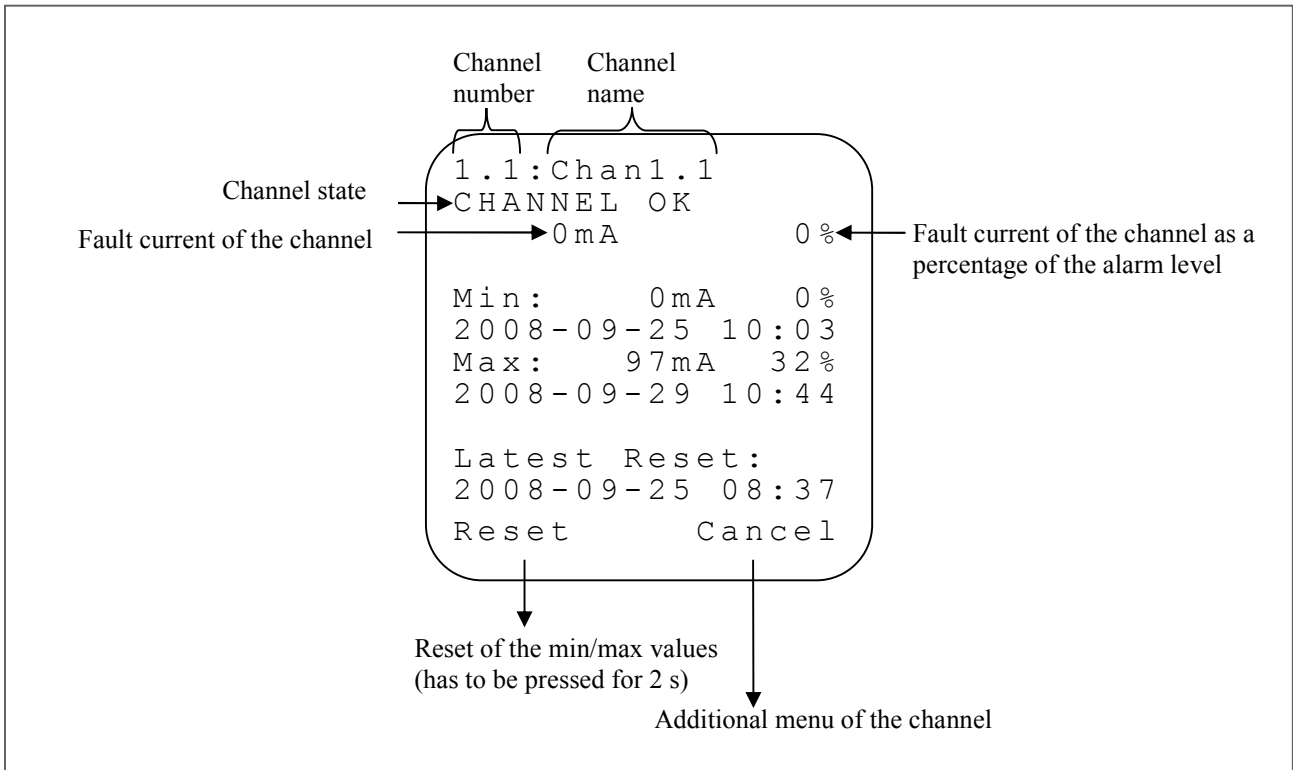


Figure 3.17. Channel's min/max current display

The basic information of the channel is shown on the first three rows: number and name, channel status (same information as on the channel specific display), fault current and fault current's ratio to the alarm level.

The channel's minimum and maximum fault current values after latest rest are shown below the basic information. Also date and time are shown for both values so it is easy to see when the fault current has been active and saved to the statistics. That information is left empty if there has not been suitable minimum or maximum current since the last reset.

The time and date of the last statistics reset for this channel can be seen below the min/max values. This value is left empty if the resetting has never been done after the device has been shipped from the factory.

The min/max statistics of the channel can be reset by pressing the "Reset" button for two seconds.

It is possible to return to the channel's additional menu by pressing the "Cancel" button.

3.7.3 ALARM HISTORY DISPLAY OF THE CHANNEL

Latest alarms and other special situations of the channel can be inspected on the alarm history display.

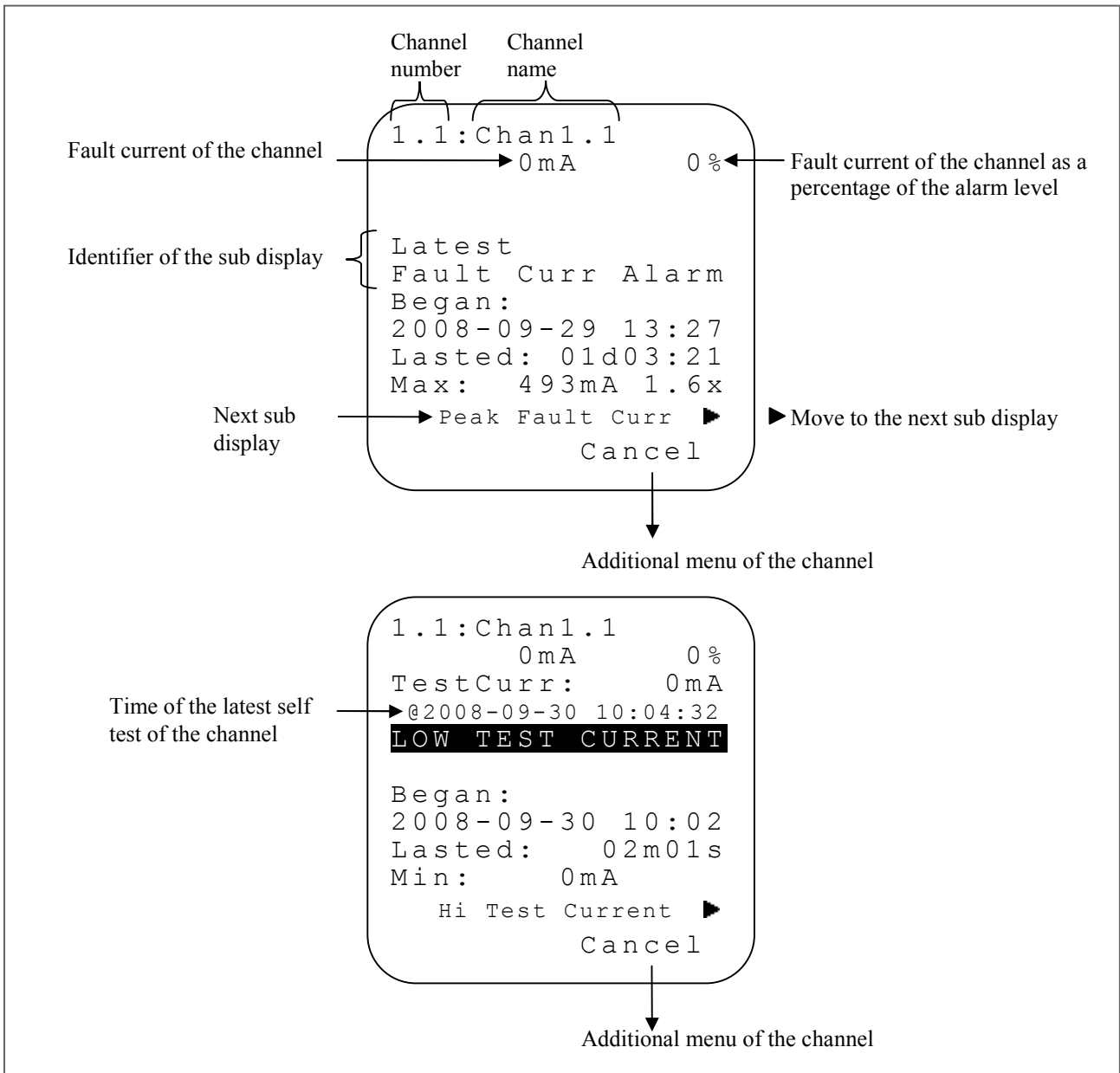


Figure 3.18. Two sub displays of the alarm history display of the channel

Alarm history display of the channel consists of five sub displays. Every one of these represents one alarm/event type. It is possible to move between the sub displays by pressing the right arrow key. Moving between the sub displays is done according to the next chart:

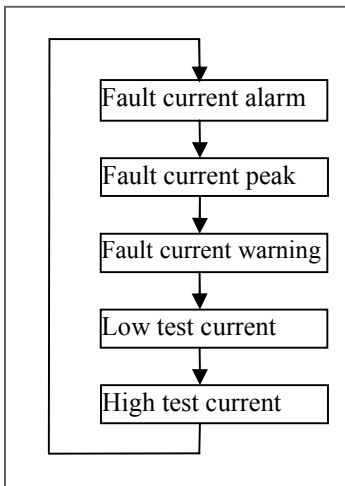


Figure 3.19. Sub displays of the alarm history display of the channel

Some sub-display may not contain any information. This is because there has not been any alarm or event of that type.

Number and name of the channel are shown on the first row. Fault current and the ratio to alarm level are shown on the second row.

The test current value measured in the latest self test is shown on the low current and high current sub-displays. Below the test current is shown the time when the self test has indicated this value.

The sub display's identifier is shown below this information. The alarm/event type is written in capital letters if the situation is still going on. The text is blinking if the situation has not been acknowledged yet. Word "Latest" is written on the first row and the type of the alarm/event is written on the second row if the situation has already been finished.

The beginning time of the situation is told below the sub channel identifier. Duration time is told below the beginning time. Duration time is given in minutes and seconds if the duration has been under one hour. In other cases the duration is shown in hours and minutes (and days if the duration is more than one day). If the duration is over 100 days, the screen shows ">100d".

Duration time is calculated from the beginning moment to the moment fault current has decreased under the alarm level (fault current alarm and current peak sub display) or under the warning level (fault current warning sub display). In case of low and high test current the beginning time is the time of the self test when the equipment failure has been detected for the first time. Duration time is calculated from the beginning moment to the moment of latest self test when the equipment fault has still been active.

If the fault current stays above the alarm level longer than the alarm delay (a current peak becomes a current fault alarm) then the beginning moment of the fault current alarm will be the beginning moment of the current peak. The information of the latest current peak will be emptied.

In the case of a fault current alarm, current peak and current warning the maximum measured current is written below the time information. The maximum test current value is told if there is a high test current alarm and the minimum test current value is told if there is a low test current alarm.

The next accessible sub display is told below the min/max row. This can be accessed by pressing the right arrow key.

It is possible to return to the channel's additional menu by pressing the "Cancel" button.

3.7.4 WAVEFORM DISPLAY OF THE CHANNEL

The waveform of the channel's fault current can be inspected on the waveform display:

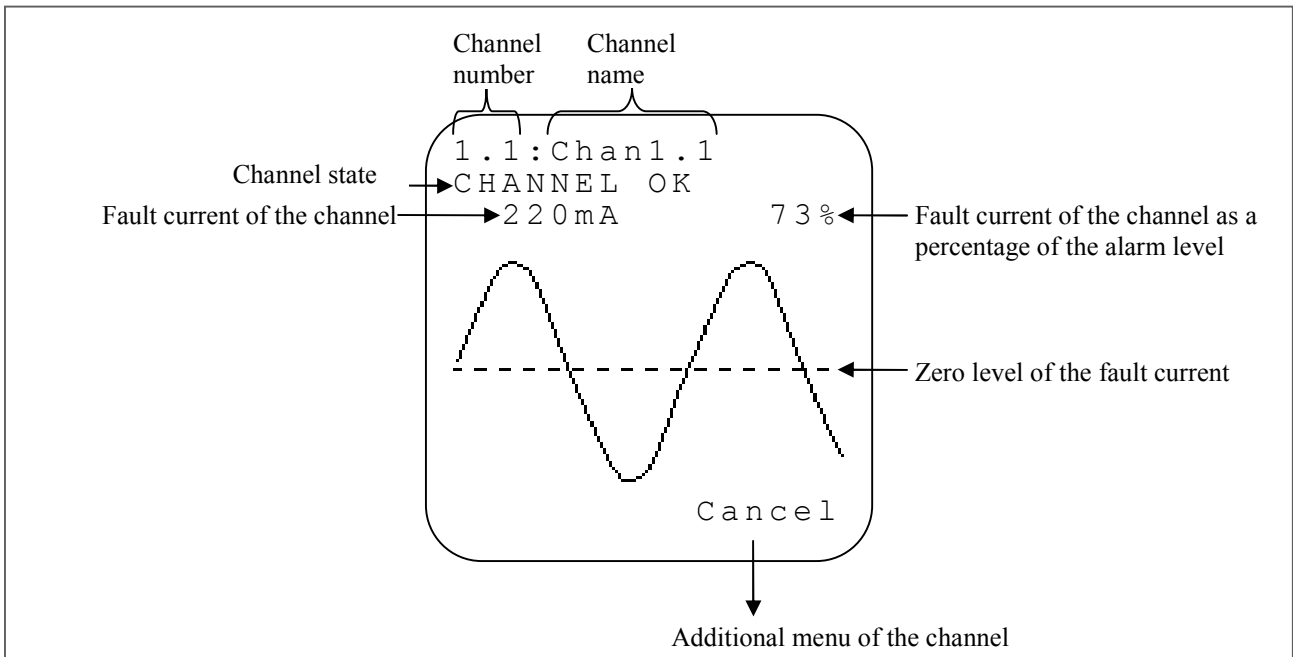


Figure 3.20. Waveform display of the channel

The channel's basic information; number and name are told in the top row. Status of the channel is also shown with the fault current value and ratio to the alarm level.

Waveform of the fault current is shown below this information. Horizontal axis represents time and vertical axis represents the momentary fault current. The dashed horizontal line represents the zero level of the fault current.

A period for about 33 milliseconds is shown at one time. Waveform is scaled vertically in relation to the alarm level. Waveform graph fills all the reserved space vertically when the current is sinusoidal and as big as the alarm level. The peaks will be cut off if the current is bigger than the alarm level.

Waveform is empty if there has not been a measurable current on channel or the channel has been disabled.

It is possible to return to the channel's additional menu by pressing the "Cancel" button.

3.8 DEVICE SETUP MENU

Channel-independent settings can be changed on the device setup menu. It is also possible to inspect the history of the latest channel alarms and equipment faults. Resetting the device to factory settings is also made in the device setup menu. It is also possible to inspect the device's model and identification information.

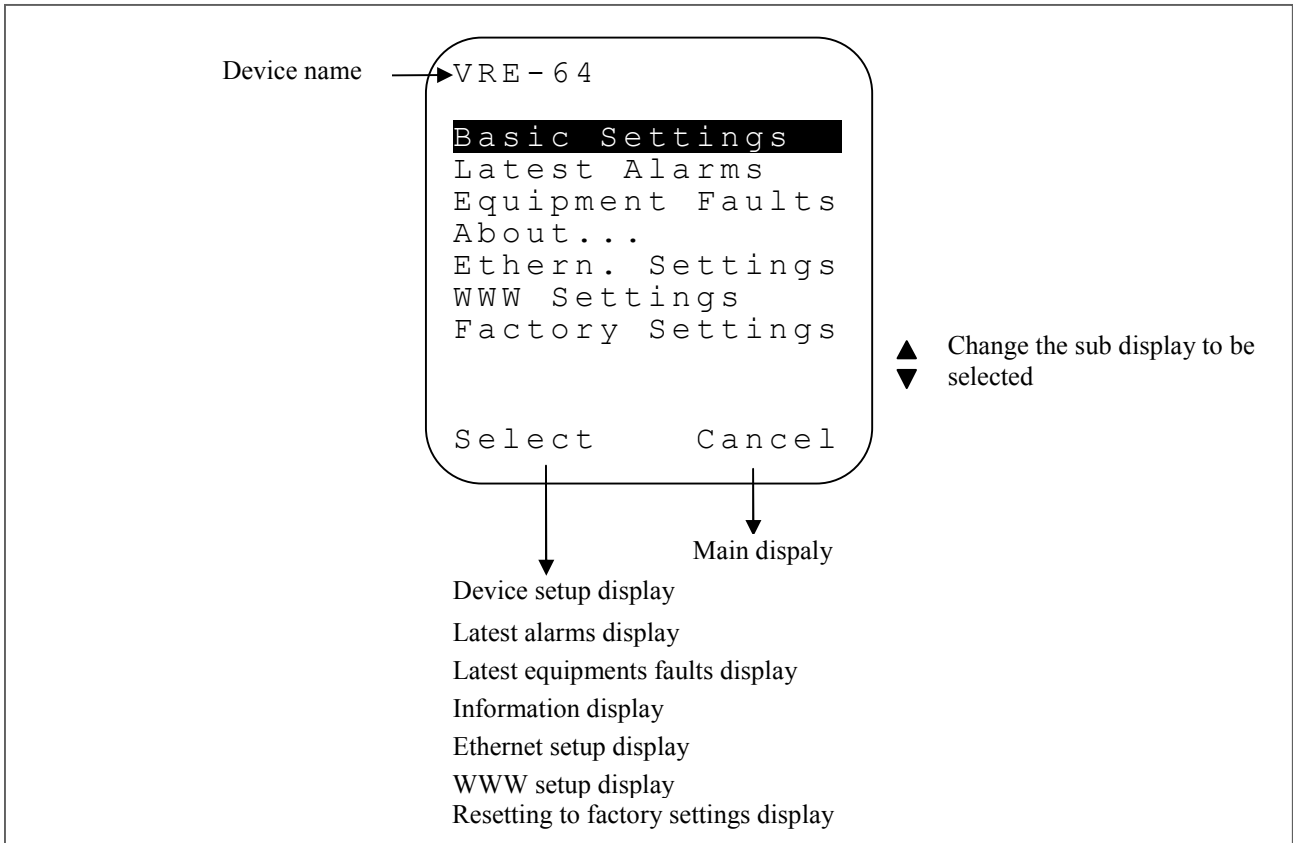


Figure 3.21. Device setup menu

The device's name is shown on the first row. The name can be changed in the settings display.

The sub menus can be seen on the next rows. Sub menu is chosen by pressing the vertical arrow keys. Selection is confirmed by pressing the "Select" button.

It is possible to return back to the main display by pressing the "Cancel" button.

3.8.1 DEVICE SETUP DISPLAY

Channel independent settings of the device can be edited on the device setup display.

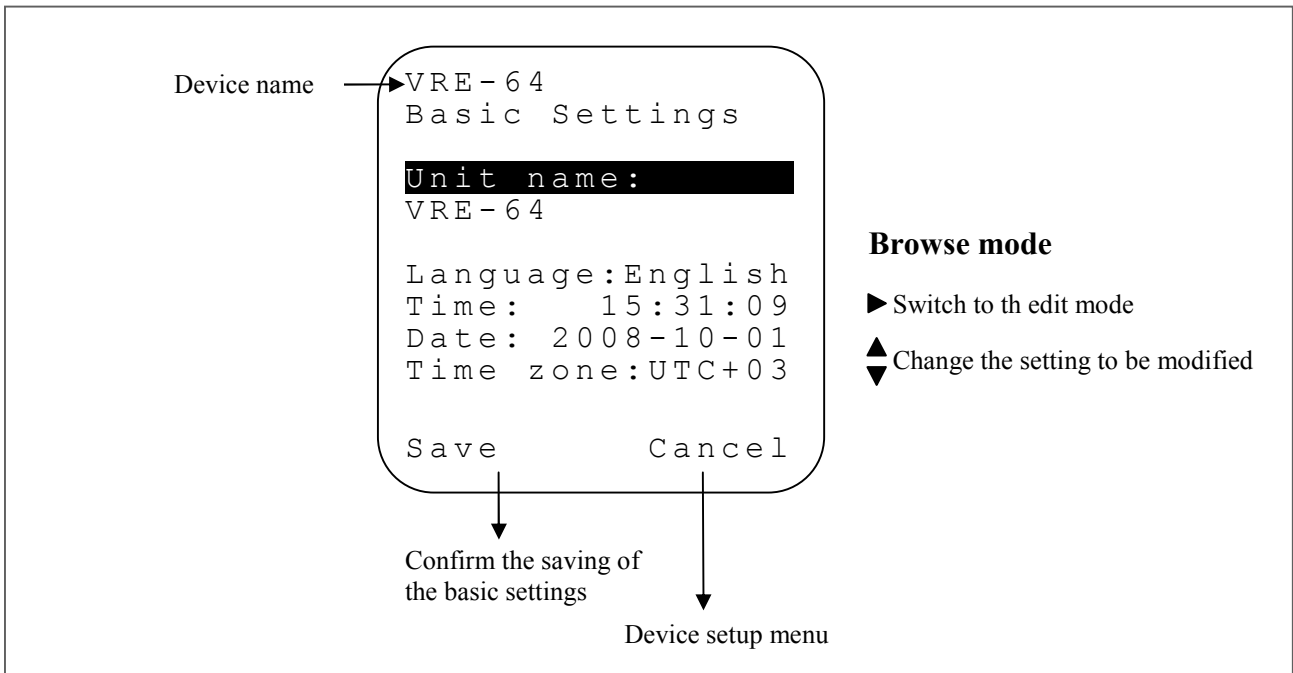


Figure 3.22. Device setup display in the browse mode

Previously given device name is shown on the first row. Editable basic settings are shown below.

Setup display has two modes: browse mode and edit mode. The setting to be edited is selected by pressing the vertical arrow keys in the browse mode. Selected setting is shown highlighted. Once the setting is selected in the browse mode it can be edited by pressing the right arrow key. This procedure initiates the edit mode, which can look like this, for example:

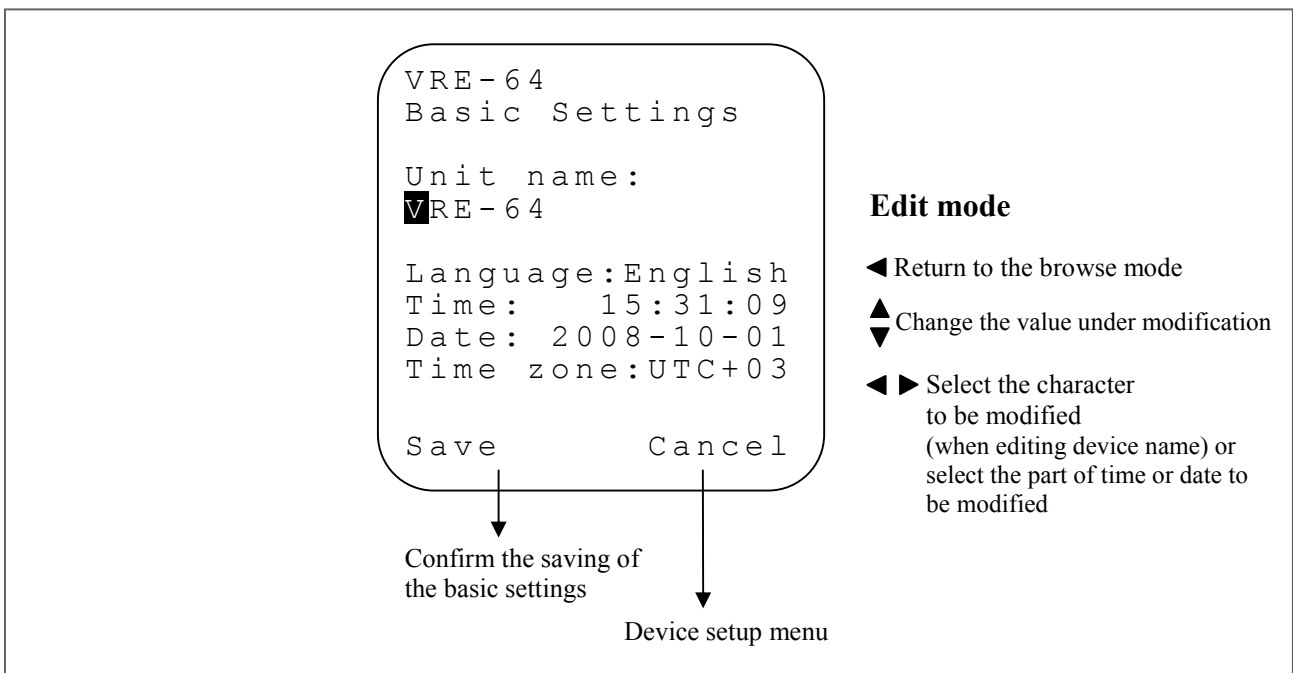


Figure 3.23. Device setup display in the edit mode

The value to be modified is highlighted in the edit mode. The value can be changed by pressing the vertical arrow keys. It is possible to return back to the browse mode by pressing the left arrow key.

The name of the device is modified by one character at a time. The character to be modified is selected by pressing the horizontal arrow keys. Maximum length for the device name is 12 characters. It is possible to return to the browse mode by pressing the left arrow key when the cursor is on the first character. The next characters are allowed to be used in the name:

space ! " # \$ % & ' () * + , - . / 0 ... 9 : ; < = > ? @ A ... Z [\] ^ _ ` a ... z { | } ~

Language setting is used to change the device's display language. The available languages are English, Swedish and Finnish. Language selection is confirmed by saving the basic settings.

The device's internal clock's time can be changed from the Time setting. The clock has a battery backup so it keeps running even if there is a power fault. Time is set in three steps: hours, minutes and seconds. Horizontal keys are used to select the value to be changed.

The device's date can be changed from the Date setting. The date is set in three steps; year, month and day. Horizontal keys are used to select the value to be changed.

Last setting is the time zone. Local time difference to UTC time is set here.

Basic settings can be saved by pressing the "Save" button. Confirmation is asked once more:

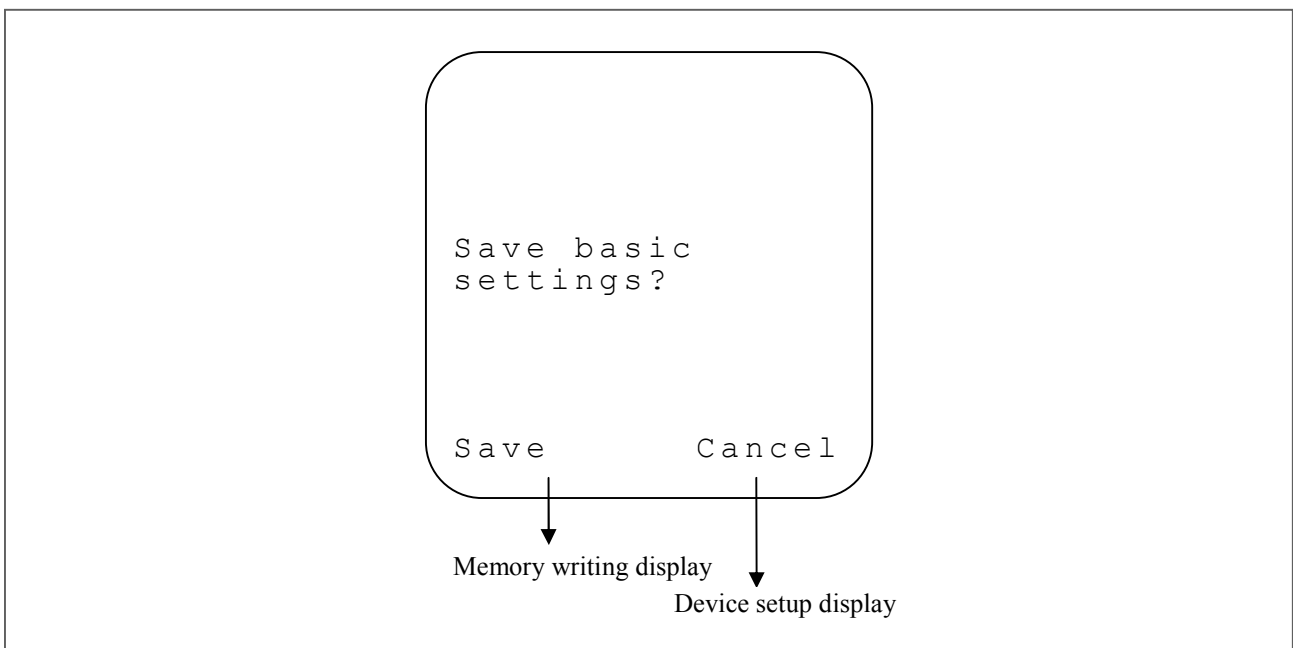


Figure 3.24. Confirmation of the saving of the basic settings

It is possible to cancel the saving procedure by pressing the "Cancel" button. After cancelling the device is returned to the setting display. All the settings are like they were before pressing the "Save" button.

The device writes the settings to flash memory after the preferred language has been selected. During the flash writing there is a notice on the display:



Figure 3.25. Writing basic settings to the Flash memory going on

NOTE! During Flash-writing it is absolutely prohibited to power down the unit. If the power is cut during the writing process, the memory can become corrupted.

Result of the writing is shown after the flash-writing is finished:

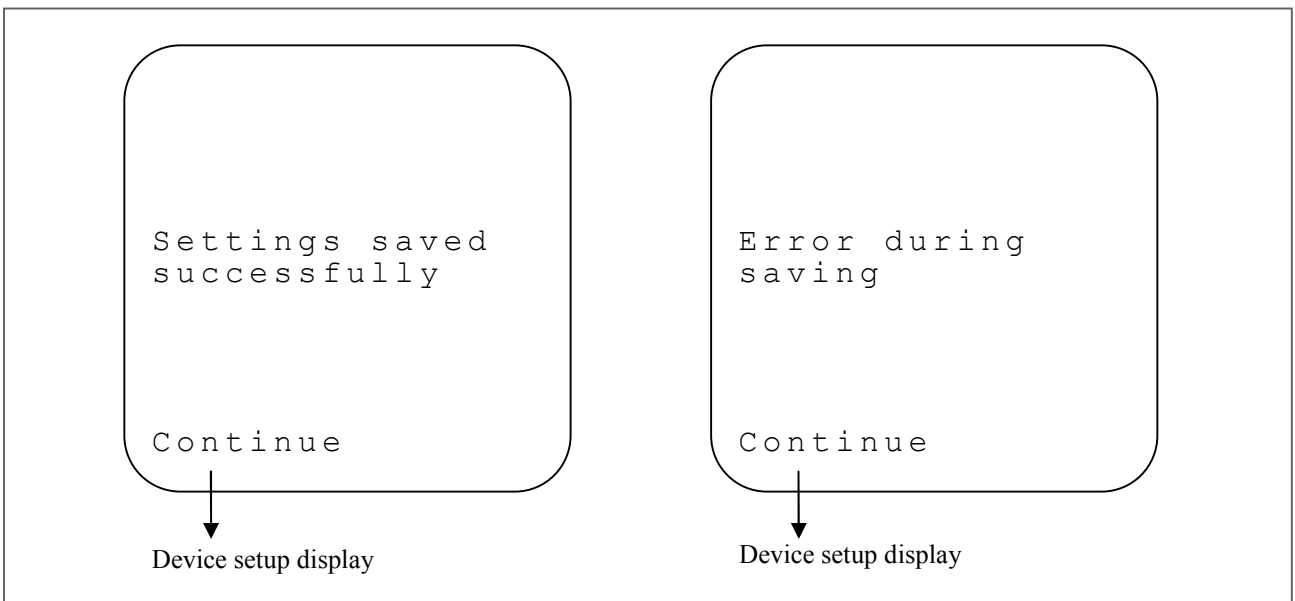


Figure 3.26. Result displays of writing the basic settings to the memory

Result display tells when the settings are saved to Flash memory. An error message will be shown if the writing procedure fails. By pressing the "Continue" button the device is returned to the device settings display.

It is possible to return to the device setup menu by pressing the "Cancel" button.

3.8.2 LATEST ALARMS DISPLAY

On the latest alarm display there can be seen the list of the latest channel specific alarms/events. This list covers all channels of the device. The length of the list is determined according to the device model:

VRE-08	10 alarms
VRE-16	20 alarms
VRE-32	40 alarms
VRE-64	80 alarms

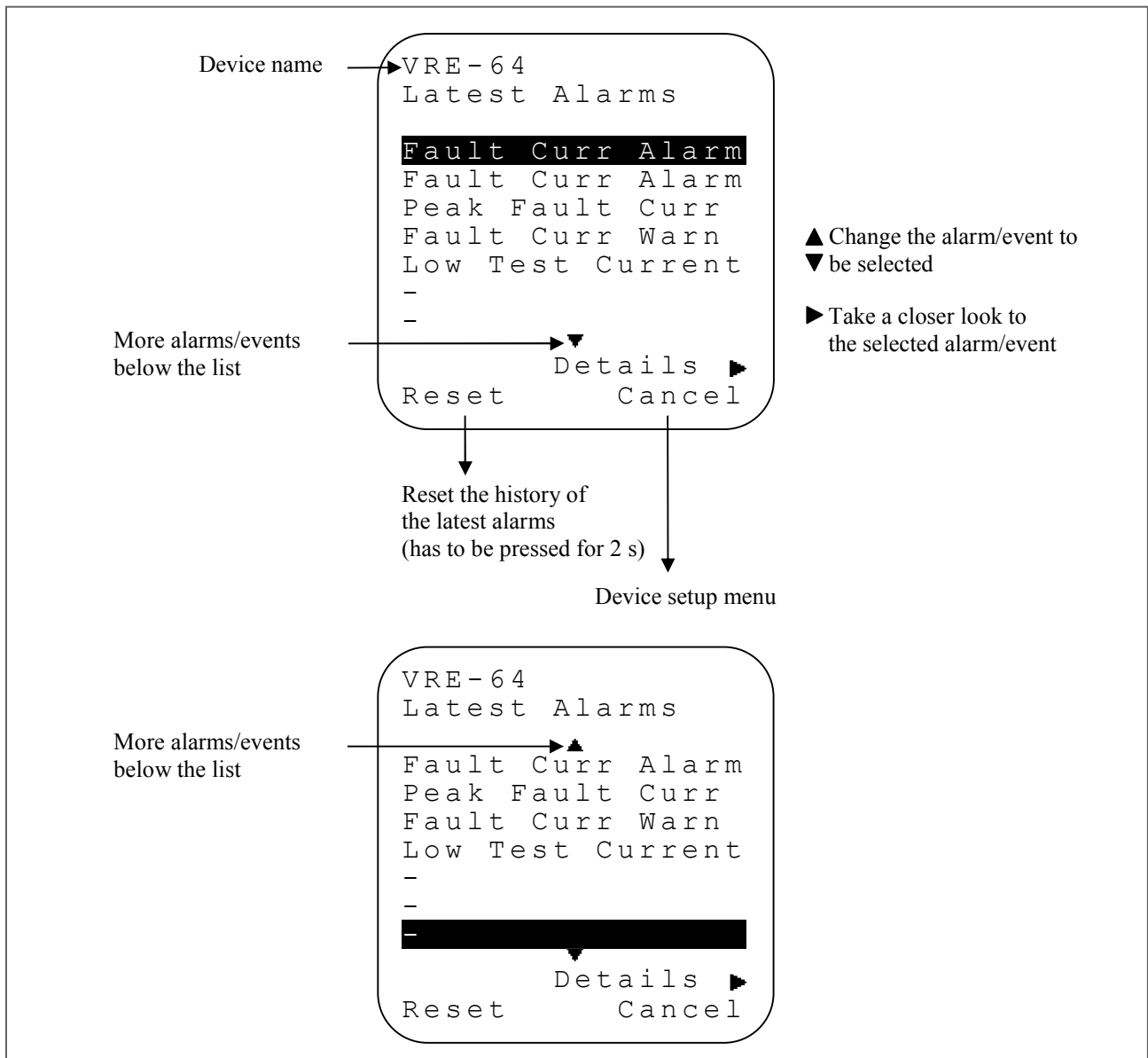


Figure 3.27. The main display of the latest alarms display

The device's name is shown on the first row. Below the name and the title can be seen the list of the device's latest channel alarms and events. One row means one alarm or event. Only the finished alarms and events end up on this list. They are no longer visible in the channel's status. Requirement is that the alarm has been acknowledged (only in fault current alarm and high/low test current) and the reason of the alarm/event has ended. A hyphen on the list means that there are no more alarms or events on the list.

Seven alarms or events can be seen on the display at one time. Three events are always hidden because of this. The arrow symbols above and below the list tell the position of the hidden rows. The hidden rows can be seen by pressing the vertical arrow keys.

By pressing the right arrow button it is possible to take a closer look to the chosen alarm or event on the alarm sub display.

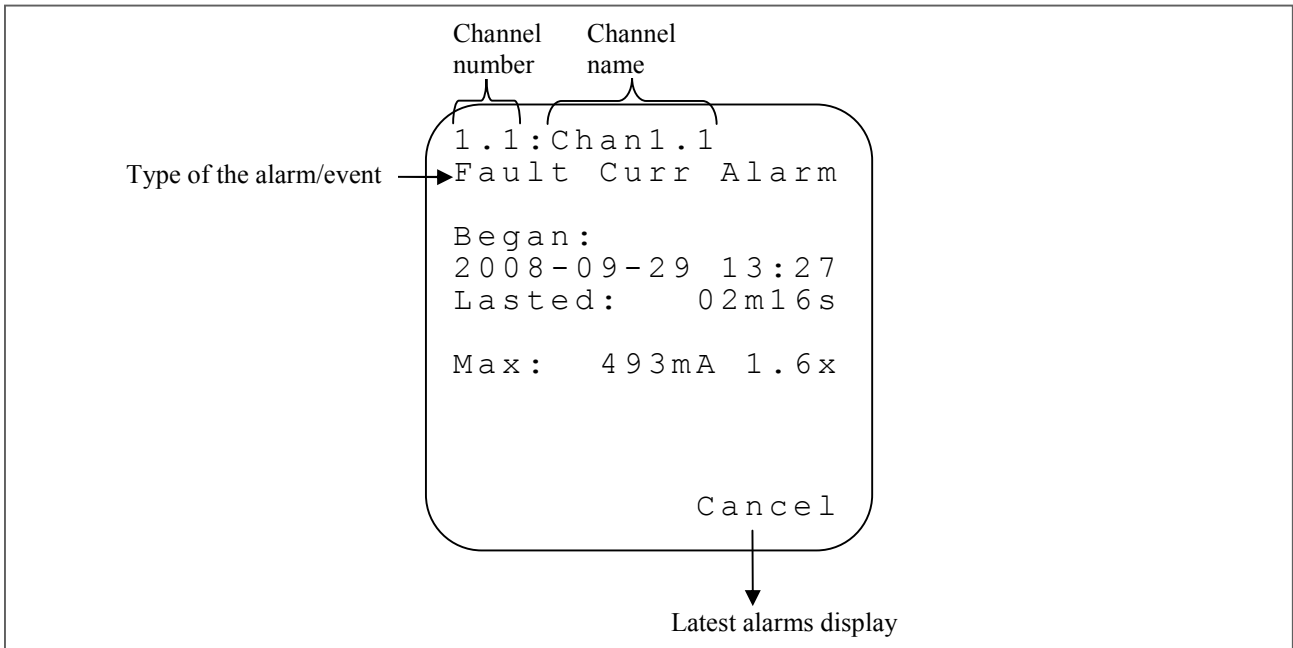


Figure 3.28. A sub display of the latest alarms display

Start time and duration of an alarm or an event is shown on the sub display. Also the max/min information is shown. This information depends on the alarm/event type:

- The maximum current value during alarm is shown in the case of a high test current
- The minimum current value during alarm is shown in the case of a low test current
- The maximum current value during alarm/event is shown in other cases.

It is possible to return to the latest alarms display by pressing the "Cancel" button.

The latest alarms history can be reset by pressing and holding the "Reset" button for at least two seconds in the main display.

It is possible to return to the device setup menu by pressing the "Cancel" button on the alarms history display.

3.8.3 LATEST EQUIPMENT FAULTS DISPLAY

A list of ten latest equipment faults can be seen on the latest equipment faults display.

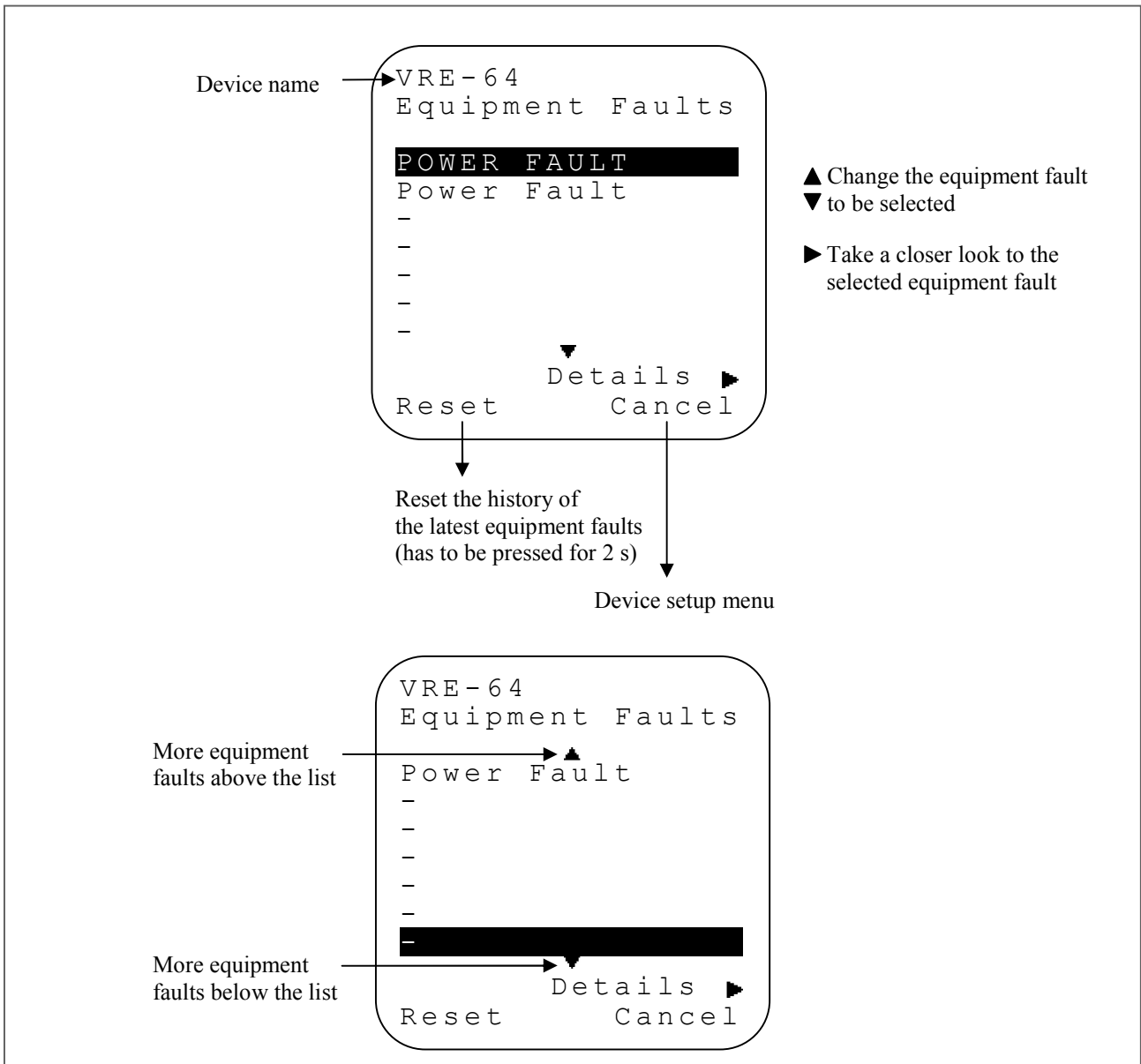


Figure 3.29. Latest equipment faults display

Device name is shown on the first row. Below the name and the title row there is a list of the latest equipment faults of the device: one row means one equipment fault. Both ongoing and finished faults are shown on the list. Non-acknowledged faults are written in CAPITAL LETTERS. Acknowledged faults are written in lower case. There may be hyphens in the rows in case there has not been ten equipment faults after the last history reset.

Seven equipment faults can be seen on the screen at the same time. Three events are always hidden because of this. The arrow symbols above and below the list tell the position of the hidden rows. The hidden rows can be seen by pressing the vertical arrow keys.

The chosen equipment fault can be inspected by pressing the right arrow key.

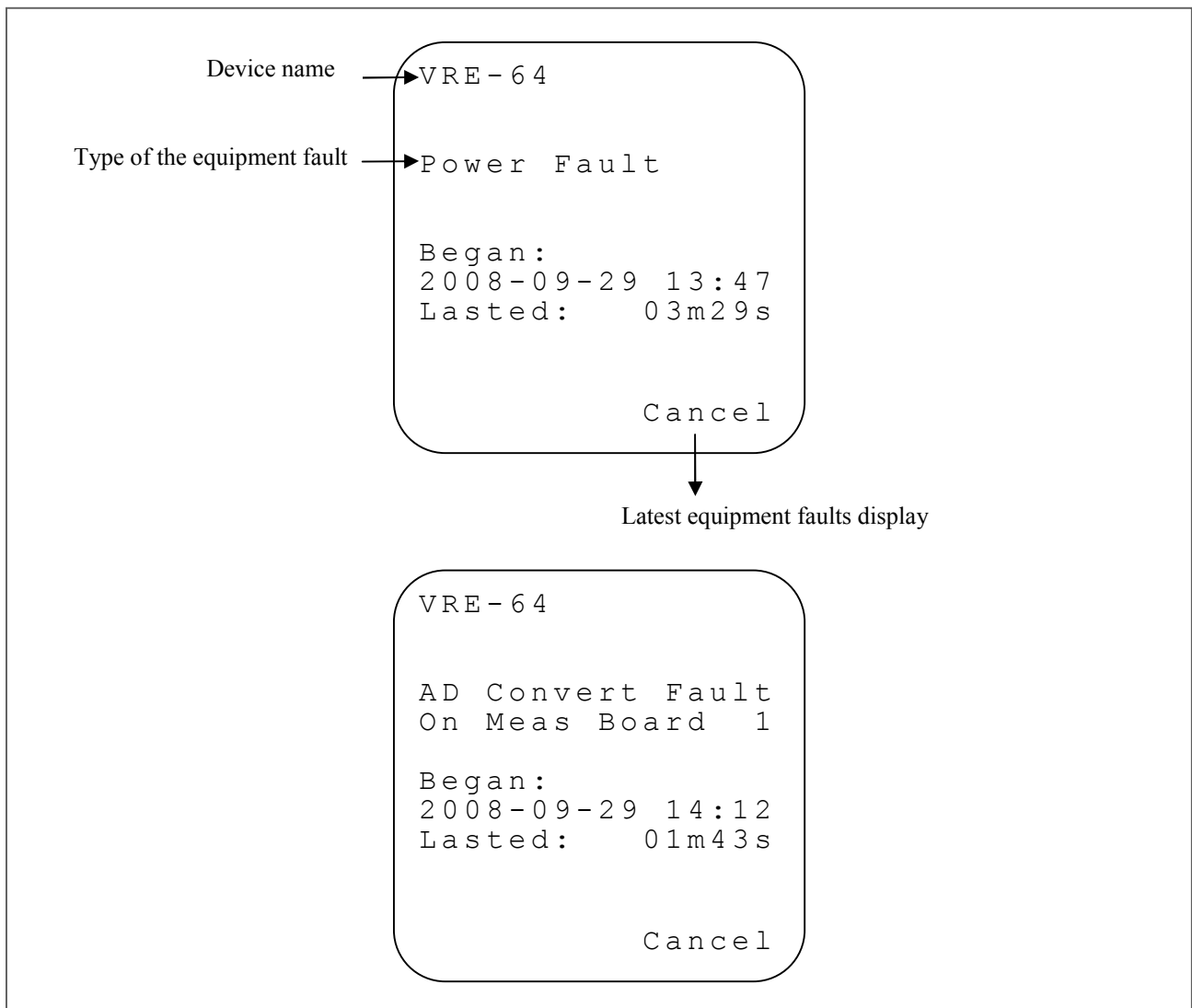


Figure 3.30. A sub display of the latest equipment faults display

Start time and duration of the fault are shown on the sub display. Also the number of the defective measurement board is shown if the fault is related to measurement procedure.

It is possible to return to the latest equipment faults display by pressing the "Cancel" button.

The history of the latest equipment faults can be reset by pressing and holding the "Reset" button for at least two seconds on the main display.

It is possible to return to the device setup menu by pressing the "Cancel" button on the main display.

3.8.4 INFORMATION DISPLAY

The model, identification and status information of the device can be inspected on the information display. This display can be accessed either from the device setup menu or by pressing the OK button in any display when there are no non-acknowledged alarms or equipment faults present.

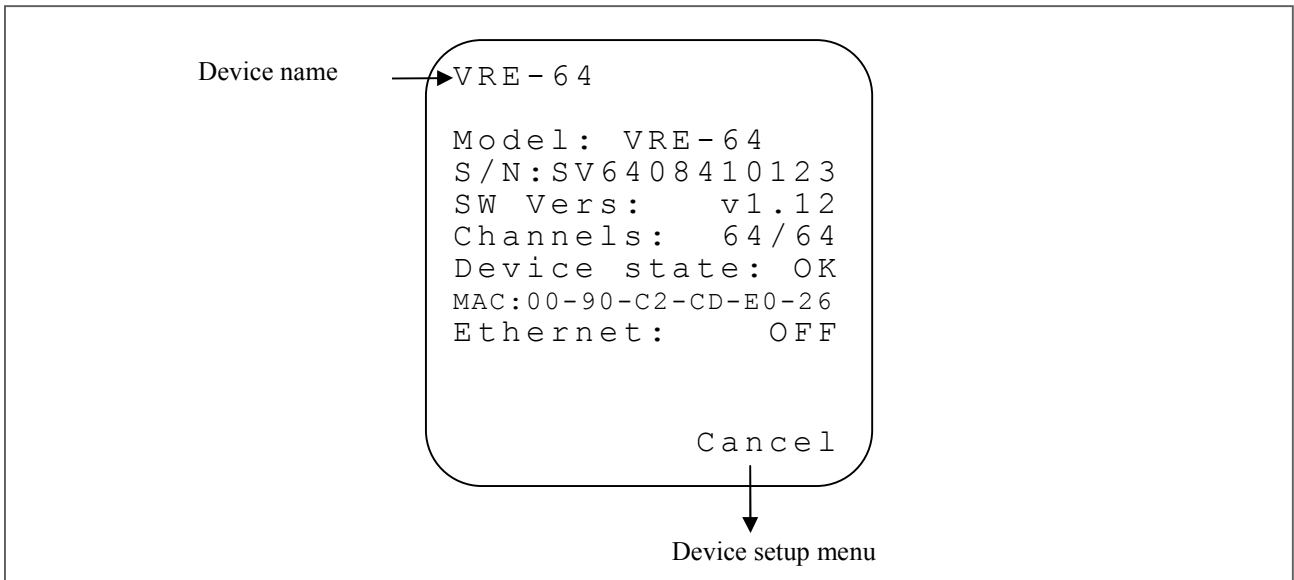


Figure 3.31. Information display

Device name is shown on the first line. The name is set on the device setup display.

Other information is shown on the next rows like this:

- model
- S/N: serial number
- SW Vers: Software version
- Channels: Number of channels in use / total number of channels in device
- Device state:

OK No non-acknowledged equipment faults

H At least one non-acknowledged equipment fault. The character is blinking if some of these faults is of alarm causing type (other than operating voltage fault).

- MAC address of the Ethernet interface
- Status of the Ethernet interface (ON/OFF)

It is possible to return to the device setup display by pressing the "Cancel" button.

3.8.5 ETHERNET SETUP DISPLAY

Settings of the Ethernet connection can be modified from the Ethernet setup display.

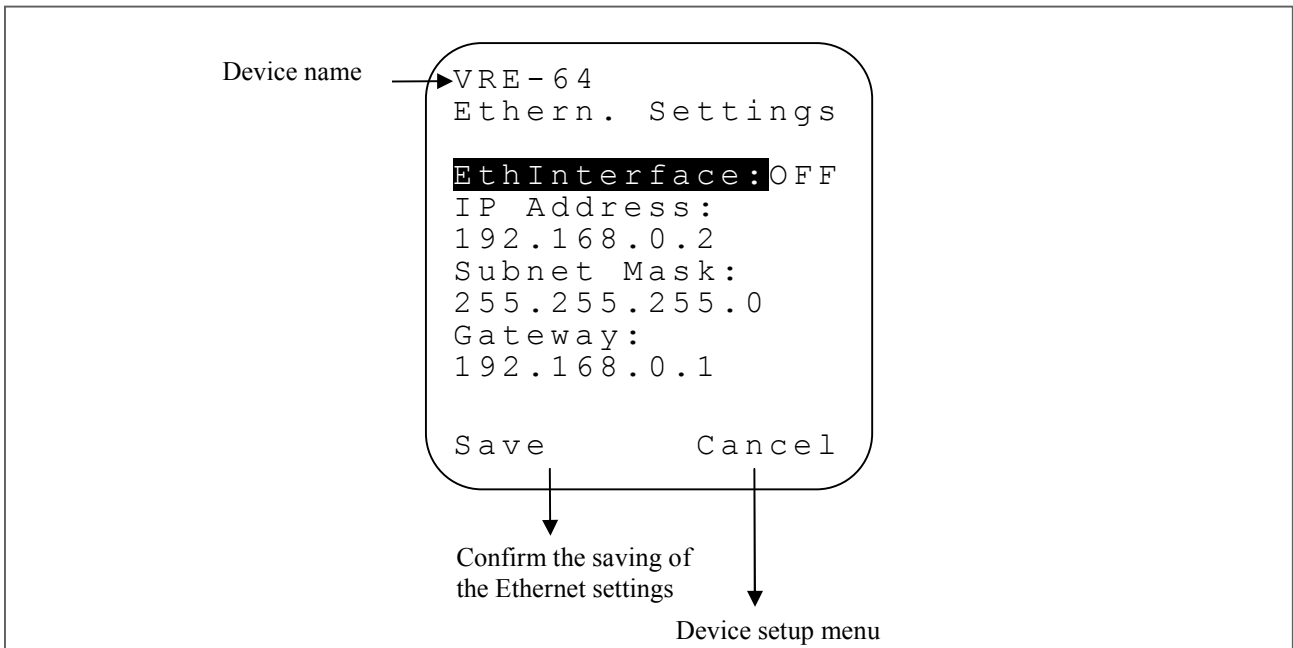


Figure 3.32. Ethernet setup display with the factory default settings

The device name is shown on the first row. Actual Ethernet settings are below the name and title.

Ethernet setup display has two function modes: browse mode and edit mode. The setting to be modified is chosen in the browse mode by pressing the vertical arrow keys. The chosen value is shown highlighted. The value can be modified by pressing the right arrow key. This initiates the edit mode where the value to be modified is highlighted. Value can be changed by pressing the vertical arrow keys. Browse mode is activated again by pressing the left arrow key.

First setting is the function mode of the Ethernet connection: ON/OFF. Ethernet connection must be set in the ON mode if the WWW remote interface is wanted to be used. Also the WWW server must be enabled from the WWW settings menu in this case.

Rest of the parameters are the address parameters of the Ethernet network. IP address is the VRE device's IP address. It is used to communicate with the device via Ethernet network. Subnet Mask and Gateway are parameters which depend on the structure of the network this device is connected to.

All parameters are given one byte at a time. The first byte is highlighted to be modified after the edit mode is activated by pressing the right arrow key. Next bytes are selected by pressing the right arrow key. When all bytes are set to correct values the browse mode is activated by pressing the left arrow key repeatedly.

NOTE 1: Ask your network administrator for the right Ethernet parameters! Problems can occur in the whole network if wrong parameters are used in the device.

NOTE 2: The IP address in the settings is the IP address to used to communicate with the device in the local network. Changes in the local network settings may be needed if it is wanted to communicate with the device from outside the local network. For example the IP address could be different from the outside than in the local network. The terminal device that is used to communicate with the VRE device must have access to TCP port 80 of the VRE device. If you need remote access to the VRE device from outside the local network, please ask your network administrator for help.

Ethernet settings can be saved by pressing the "Save" button. Confirmation is asked once more:

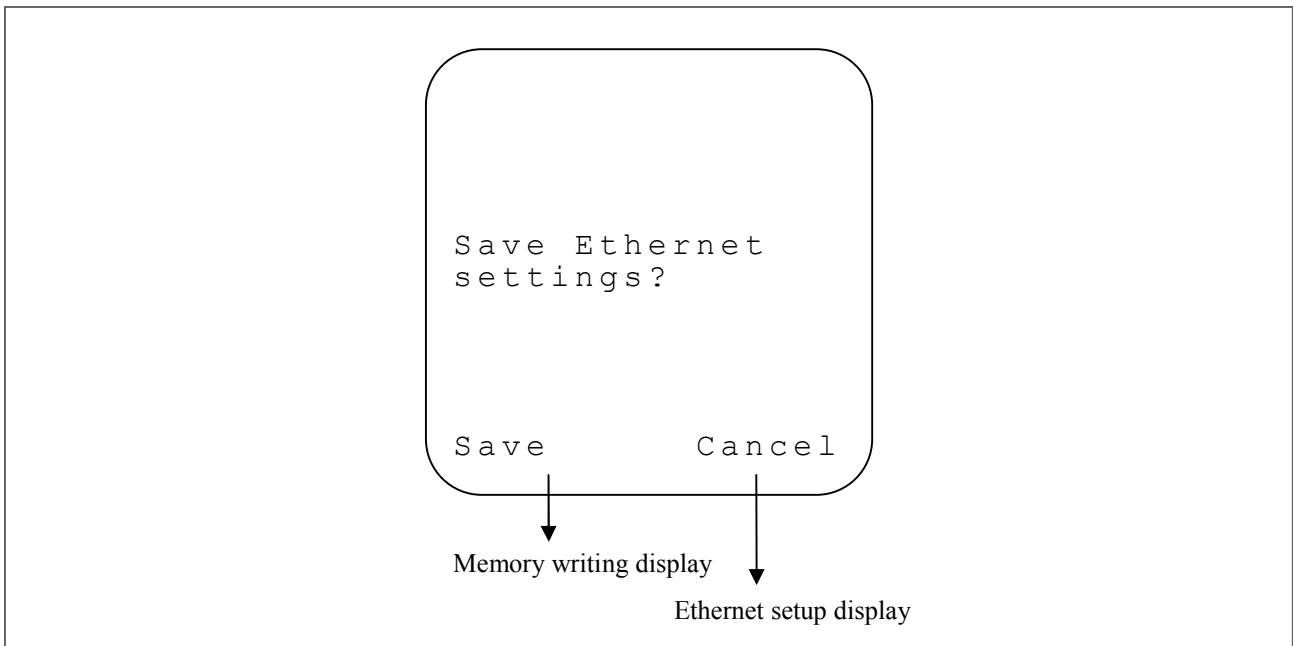


Figure 3.33. Confirmation of the saving of the Ethernet settings

It is possible to cancel the saving procedure by pressing the "Cancel" button. After cancelling the device is returned to the Ethernet settings display. All the settings are like they were before pressing the "Save" button.

The device writes the settings to flash memory after the confirmation. During the flash writing there is a notice on the display:



Figure 3.34. Writing Ethernet settings to the Flash memory going on

NOTE! During Flash-writing it is absolutely prohibited to power down the unit. If the power is cut during the writing process, the memory can become corrupted.

Result of the writing is shown after the flash-writing is finished:

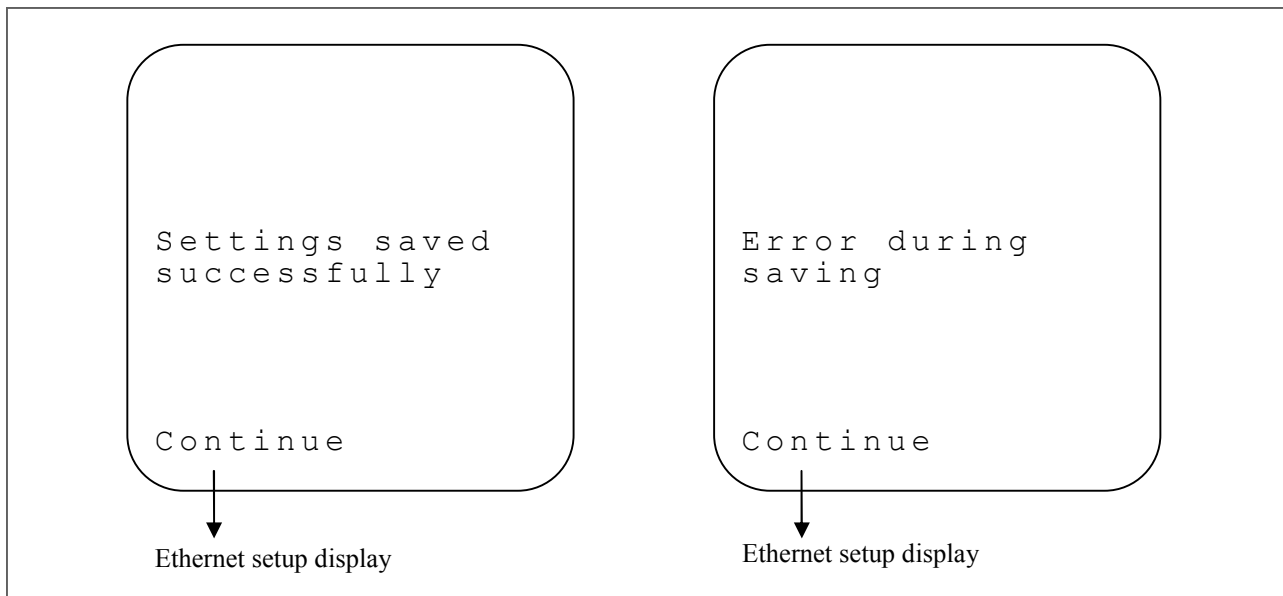


Figure 3.35. Result displays of writing the Ethernet settings to the memory

Result display tells when the settings are saved to Flash memory. An error message will be shown if the writing procedure fails. By pressing the "Continue" button the device is returned to the Ethernet settings display.

It is possible to return to the device setup menu by pressing the "Cancel" button.

3.8.6 WWW SETUP DISPLAY

Settings of the WWW remote interface can be changed on the WWW setup display.

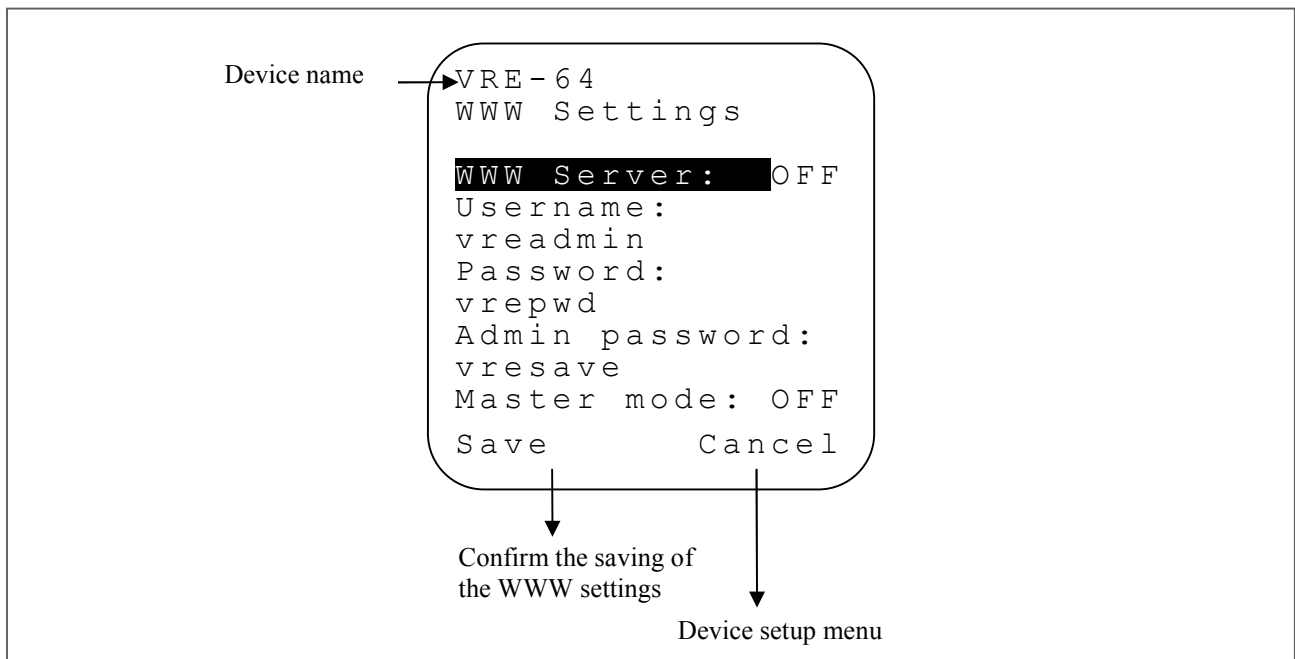


Figure 3.36. WWW setup display with the factory default settings

Device name is shown on the first row. Actual WWW settings are shown below the name and title.

WWW setup display has two function modes: browse mode and edit mode. The setting to be modified is chosen in the browse mode by pressing the vertical arrow keys. The chosen value is shown highlighted. The value can be modified by pressing the right arrow key. This initiates the edit mode where the value to be modified is highlighted. Value can be changed by pressing the vertical arrow keys. Browse mode is activated again by pressing the left arrow key.

First setting is the function mode of the WWW Server (ON/OFF). This allows the use of the remote interface of the VRE device. Please note that also the Ethernet connection must be enabled to use the remote interface. After both settings have been enabled the remote connection can be initiated by starting a WWW browser and entering the VRE device's IP address to the address field of the browser. Please note that the IP address can also be different in some cases (see chapter 3.8.5 Ethernet setup display). When the connection is being established the WWW server asks first the user name and password. WWW remote interface opens after the user has entered the correct user name and password. The device also has a separate administrator password which is required when saving settings from the WWW interface.

User name, password and admin password can be set in the WWW setup display. All of these are input in the same way: Edit mode is activated by pressing the right arrow key. First character of the user name/password is highlighted to be modified. Next character can be selected by pressing the right arrow key. When all characters are set to correct values the browse mode is activated by pressing the left arrow key repeatedly.

User name and passwords can be 1-12 characters in length. Next characters can be used in this order:

0...9 A...Z a...z

NOTE 1: It is strongly recommended to change the user name and password when the WWW remote interface is initialized for the first time!

NOTE 2: All data traffic of the WWW remote interface (including the sending of the user name and password) passes through the Ethernet network unencrypted!

WWW remote interface has an option for Master-mode, where maximum of 31 VRE-08/16/32/64 devices can be monitored in a single screen. Master mode is enabled with the setting "Master mode". Additional information is found in the section 4.13 Master-display in the WWW remote interface.

WWW settings can be saved by pressing the "Save" button. Confirmation is asked once more:

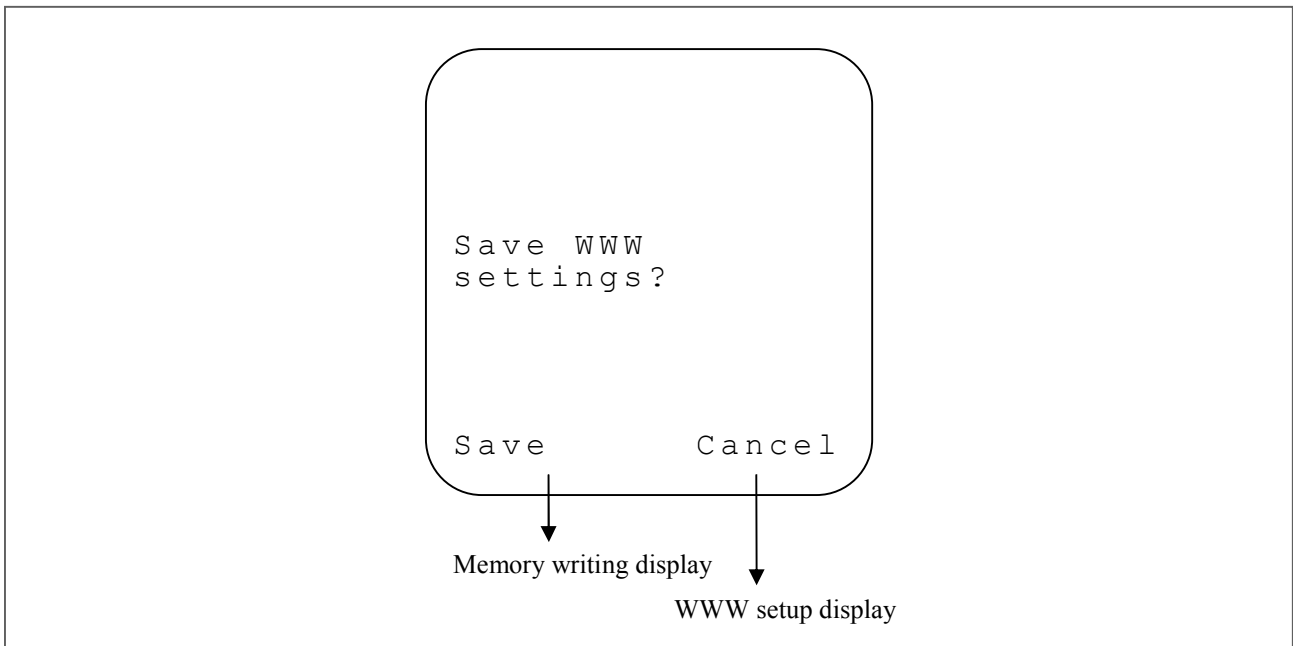


Figure 3.37. Confirmation of the saving of the WWW settings

It is possible to cancel the saving procedure by pressing the "Cancel" button. After cancelling the device is returned to the WWW settings display. All the settings are like they were before pressing the "Save" button.

The device writes the settings to flash memory after the confirmation. During the flash-writing there is a notice on the display:



Figure 3.38. Writing WWW settings to the Flash memory going on

NOTE! During Flash-writing it is absolutely prohibited to power down the unit. If the power is cut during the writing process, the memory can become corrupted.

Result of the writing is shown after the flash-writing is finished:

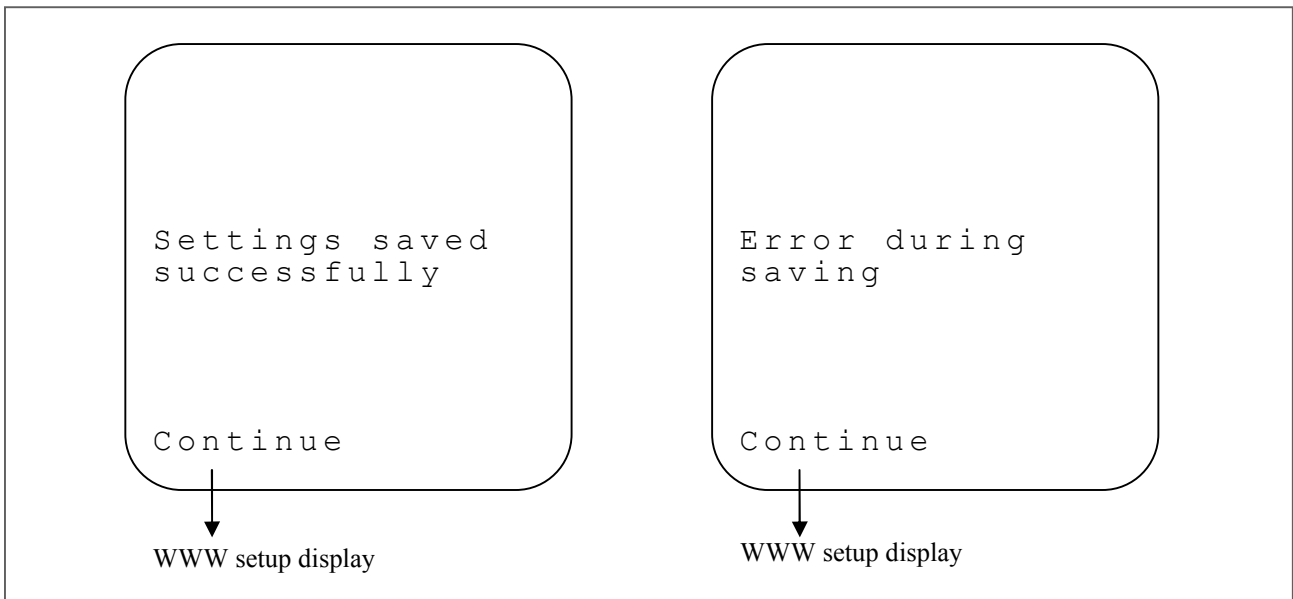


Figure 3.39. Result displays of writing the WWW settings to the memory

Result display tells when the settings are saved to Flash memory. An error message will be shown if the writing procedure fails. By pressing the “Continue” button the device is returned to the WWW settings display.

It is possible to return to the device setup menu by pressing the ”Cancel” button.

3.8.7 RESETTING TO FACTORY SETTINGS DISPLAY

In the factory settings display it is possible to reset all settings to default values and erase all history information.

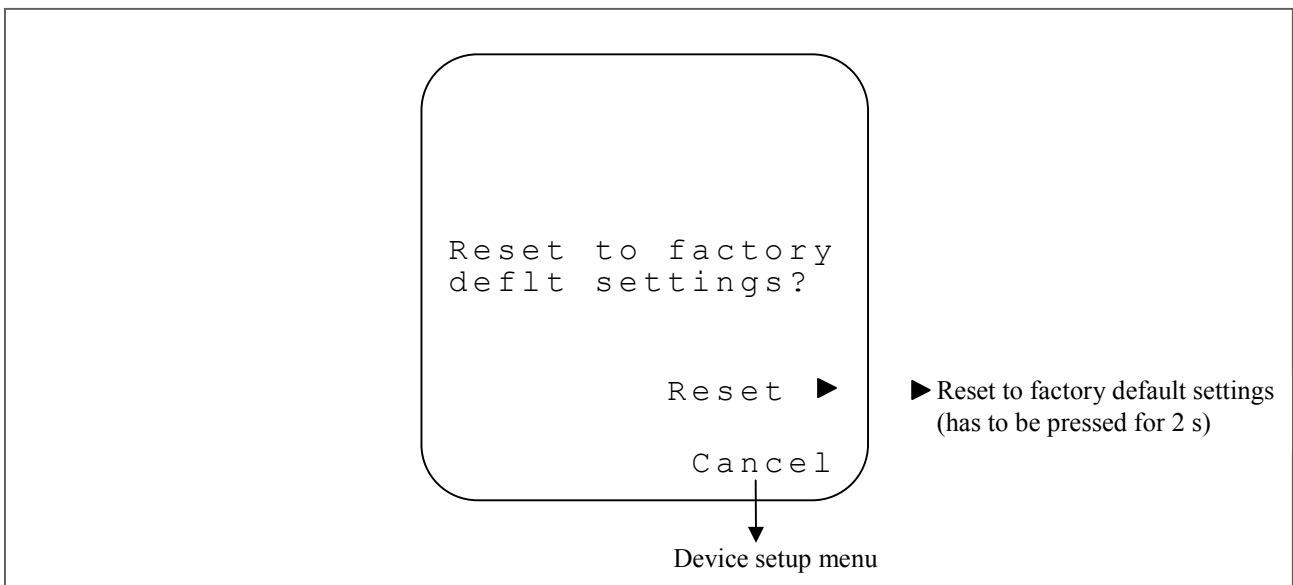


Figure 3.40. Resetting to factory settings display

Resetting to factory setting is initiated by pressing the right arrow key in this display mode for at least two seconds. The device writes the settings to flash memory. During the flash writing there is a notice on the display:

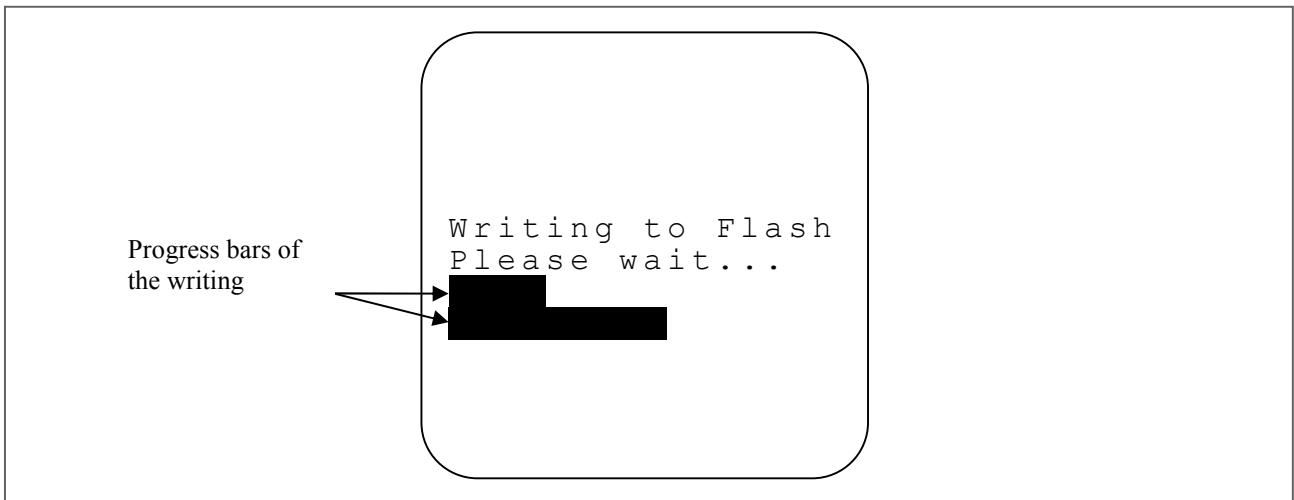


Figure 3.41. Writing factory settings to the Flash memory going on

The progress of the flash writing can be seen on the display. It is shown by two horizontal bars:

- Upper bar shows the progress of the total writing procedure.
- Lower bar shows the progress of the writing of the channel settings.

The duration of the flash-writing depends on the device model. For example with VRE-08 it takes for about ten seconds. With VRE-64 it takes for about one minute.

NOTE! During Flash-writing it is absolutely prohibited to power down the unit. If the power is cut during the writing process, the memory can become corrupted.

The user language has to be set after the resetting. See chapter 3.1 Selecting the language. Result of the writing is shown after the language has been selected:

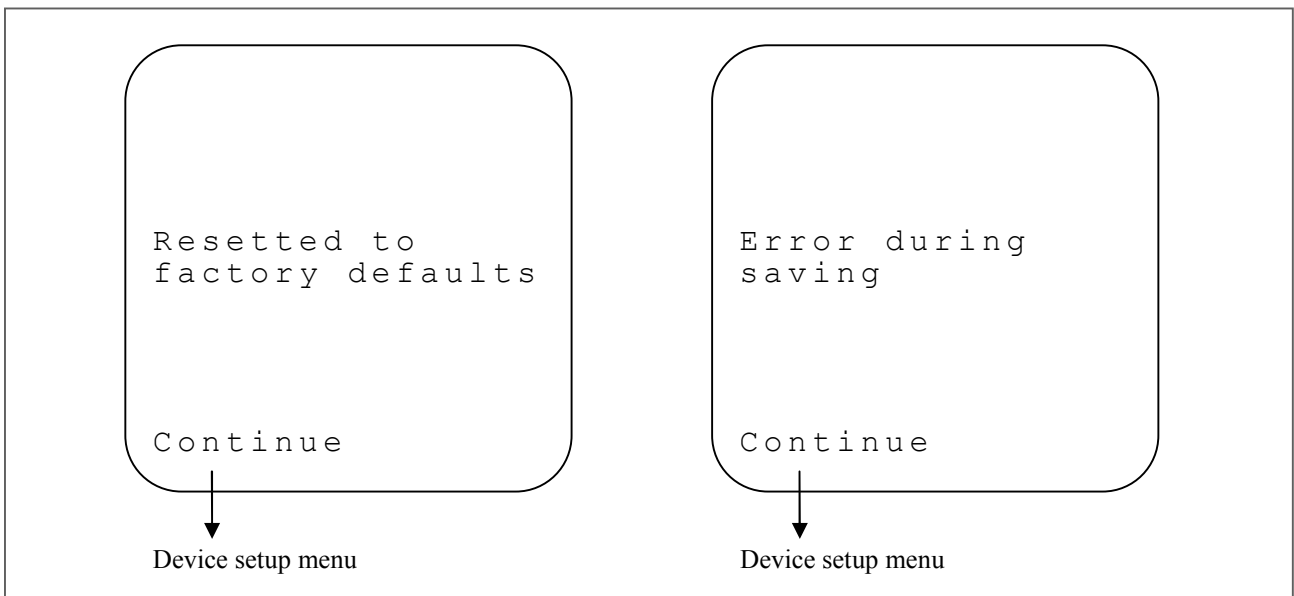


Figure 3.42. Result displays of writing the factory settings to the memory

Result display tells when the factory settings are saved to Flash memory. An error message will be shown if the writing procedure fails. By pressing the “Continue” button the device is returned to the device setup menu.

It is possible to return to the device setup menu by pressing the ”Cancel” button.

4 WWW REMOTE INTERFACE

4.1 OPERATION OF THE ETHERNET LEDS

VRE-08/16/32/64 devices contain an Ethernet network connection. The devices can be remotely used with the network connection.

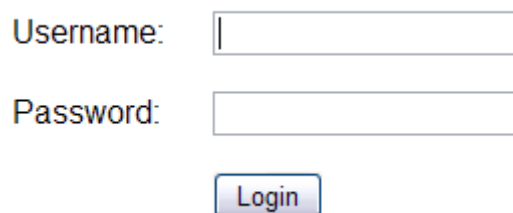
The device's front panel contains two led's, which indicate the operation of the Ethernet-connection (for more information see 2.2.1 The front panel). Green Ethernet-Line led is on when the Ethernet-connection of the device is activated (see 3.8.5 Ethernet setup display) and the device is connected to network using RJ45-type cable plugged in the connector J5 (see 2.2.3 Electrical installation). Yellow Ethernet-Traffic led is blinking when a WWW remote user is connected to the device and there is data transferred between the device and the remote user.

4.2 OPENING THE WWW REMOTE INTERFACE CONNECTION

WWW remote interface is used with a web browser. Use of Mozilla Firefox is strongly recommended. The operation of the WWW remote interface has been verified with Mozilla Firefox versions 2 and 3. Google Chrome is proven to be working also. Chrome version is 11.0.696.68 in the time of creating this document.

WWW remote interface may be functional also with other web browsers. Muuntosähkö Oy Trafox does not however take responsibility of the WWW remote interfaces compatibility with other than fore-mentioned web browsers.

Connection to remote interface is opened by writing the IP address of the VRE-device to the web browser's address field (see 3.8.5 Ethernet setup display). After the connection has been established the web browser asks for a user name and password:



Username:

Password:

Figure 4.1. Filling in the user name and password for the WWW remote interface

User name and password must be given in the query window (see 3.8.6 WWW setup display). Note that the user name and password are both case sensitive. They must be input precisely like they have been set up in the WWW settings. The remote interface does not open if the correct user name and password have not been given.

NOTE 1: All data traffic of the WWW remote interface (including the sending of the user name and password) is transferred through the Ethernet network unencrypted!

NOTE 2: Link buttons on the page are used to navigate through the WWW remote interface. Pressing the “Previous page” button of the browser takes you to the page which was opened in the browser before the loading of the WWW remote interface. The “Previous page” and “Next page” buttons of the browser cannot be used to navigate in the WWW remote interface.

The loading of the WWW remote interface starts after the user name and password have been given:

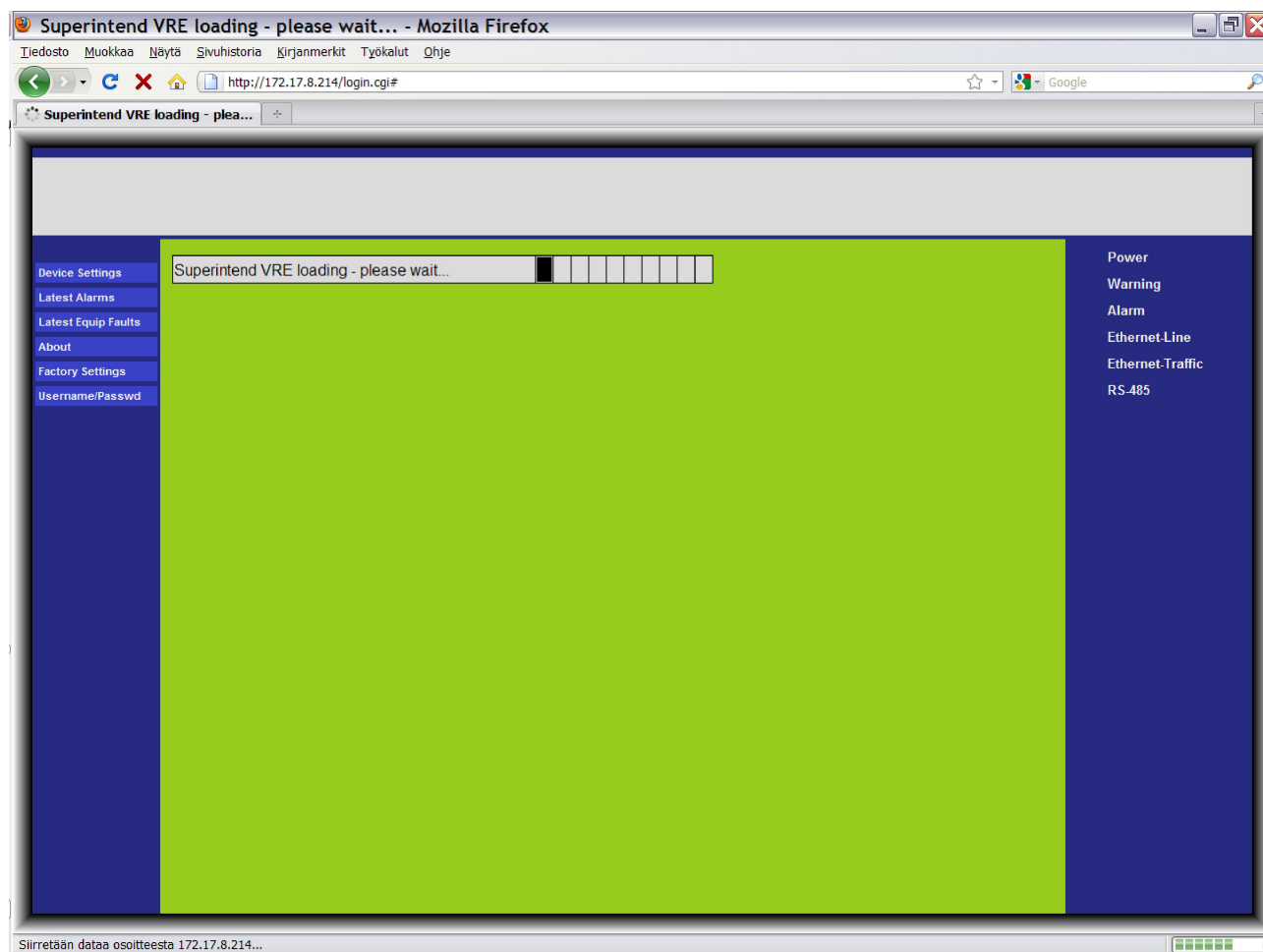


Figure 4.2. Loading of the WWW remote interface

The loading time is a few tens of seconds. The time depends on the device type (VRE-08 is the fastest and VRE-64 is the slowest), number of users connected to the device at the same time, and the speed of the network the device is connected to.

During loading the page may look different than in the figure 4.2 until all of the images have been loaded in the WWW page.

4.3 WWW MAIN DISPLAY

WWW main display is shown after the WWW remote interface has been loaded.

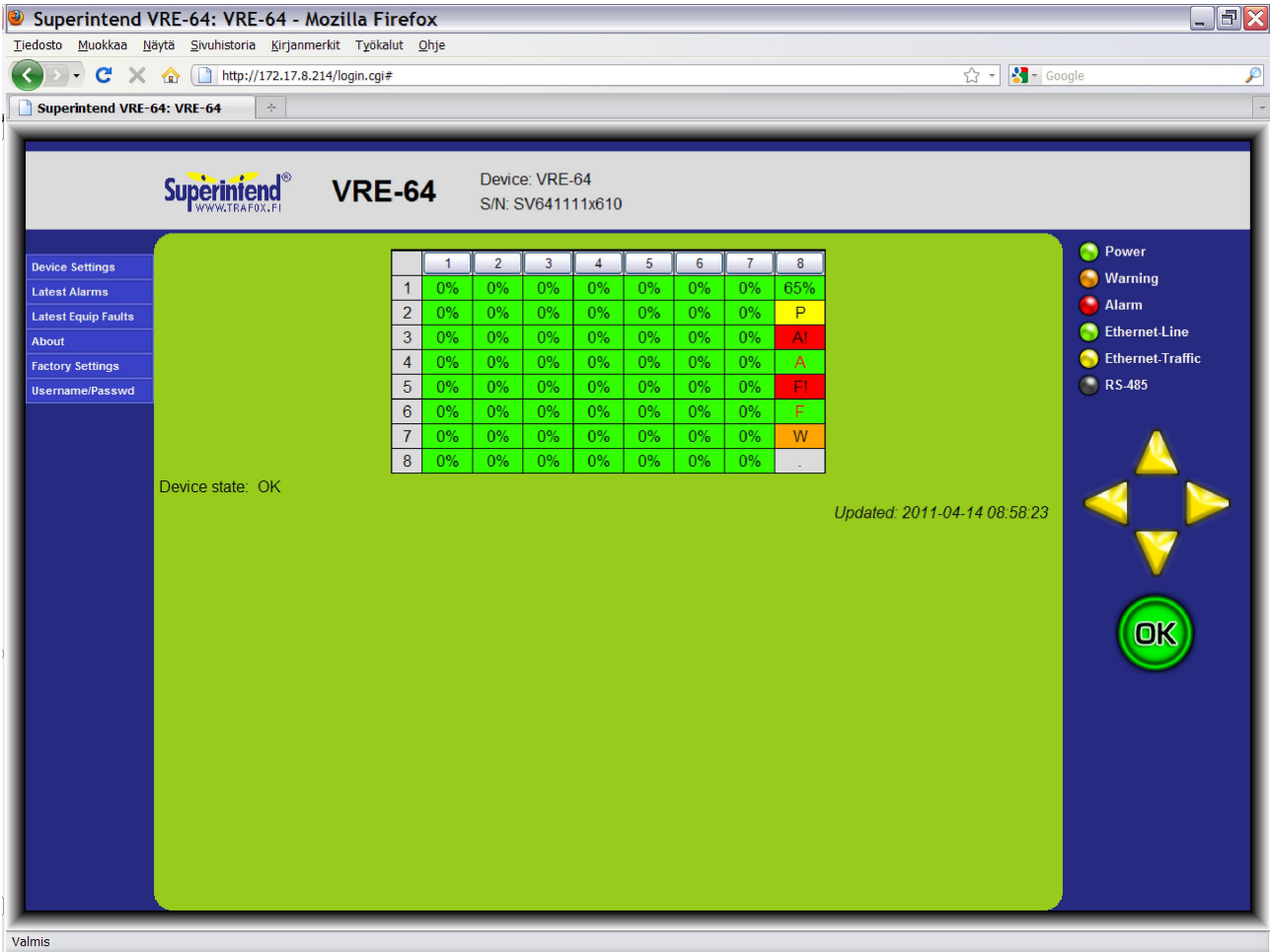


Figure 4.3. WWW main display

The device model, name of the device and the serial number are shown in the device information bar which is located in the top.

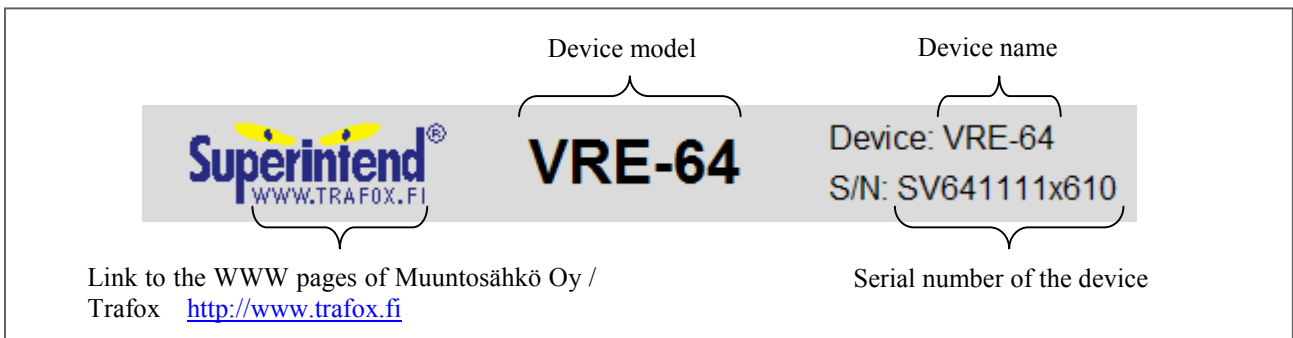


Figure 4.4. Device information bar of the WWW remote interface

Device settings can be changed from the settings panel which can be found on the left side of the screen. Also the device statistics can be found under this panel.

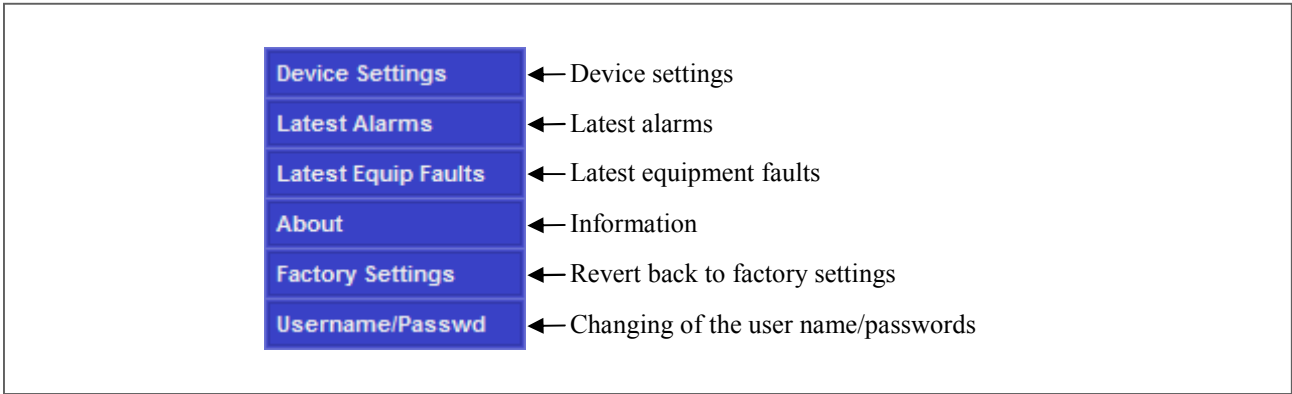


Figure 4.5. Settings panel of the WWW remote interface

Pressing a button on the setting panel initiates the corresponding settings display or statistical display.

Indicator light and button panel is located on the right side of the window. The operation is similar to the operation of the front panel of the device.

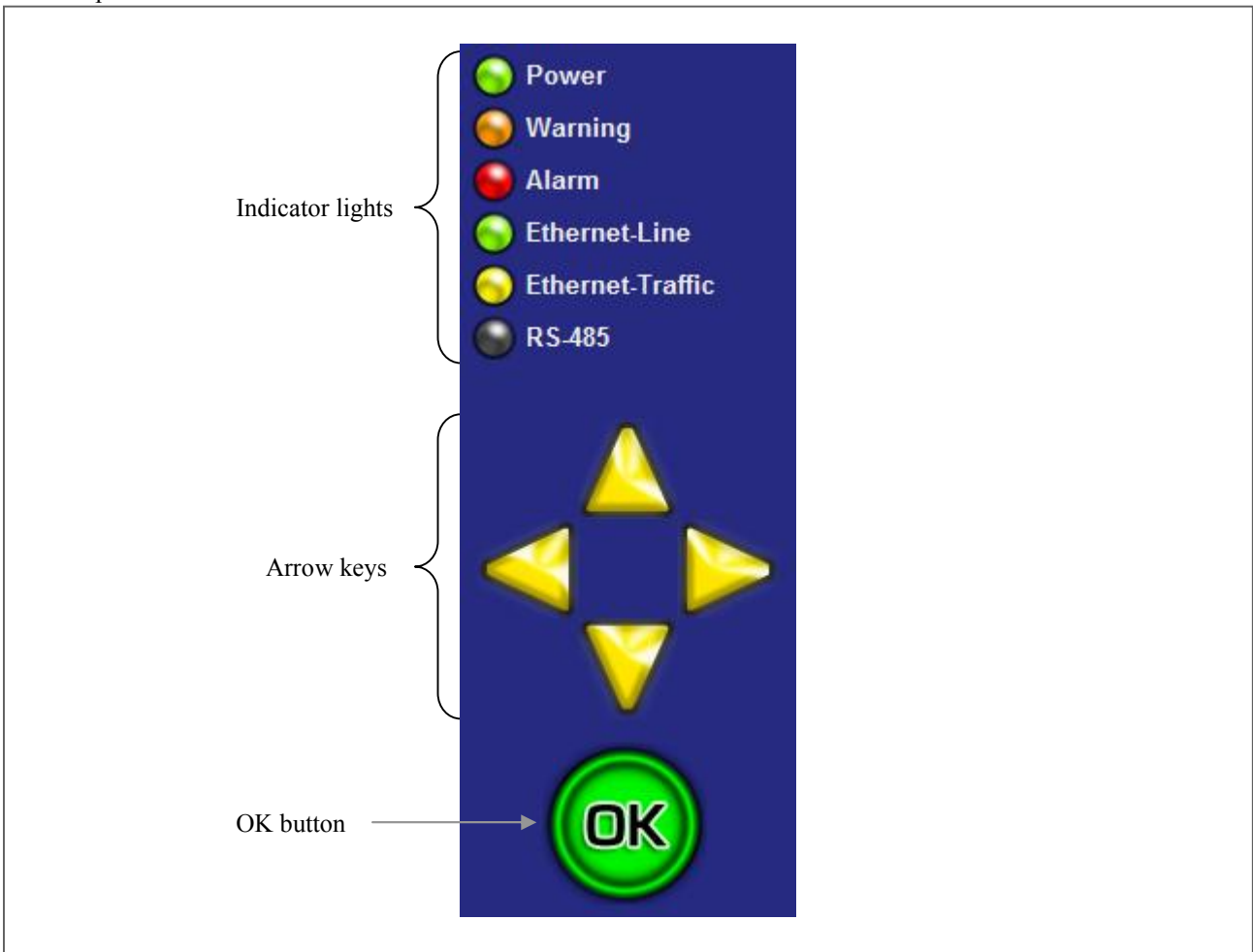


Figure 4.6. Indicator light and button panel of the WWW remote interface

Panel has the same indicator lights that also the device's front panel has (see 2.2.1 The front panel). However, some of the indicator lights have a different operation principle:

- **Power** light is always on
- **Warning** light is on if there is at least one fault current warning going on

- **Alarm** light is blinking if there is at least one non-acknowledged fault current alarm, equipment fault alarm or equipment fault (other than power fault).
- **Ethernet-Line** light is always on
- **Ethernet-Traffic** light is on when information is updated from the device to the WWW remote interface.
- **RS-485** light is not in use

Arrow keys are used in the WWW remote interface like this:

- in the board specific display the measurement board can be selected with the horizontal arrow keys (see 4.4 Board specific WWW display). This is disabled for VRE-08 as it has only one measurement board.
- the viewable channel is selected by pressing the vertical arrow keys.

OK button is used to quickly get to the acknowledgement mode for an alarm or equipment fault from the WWW remote interface. The basic principle and function of the OK button is similar to the function of the OK button in the device's front panel. The display state will be changed if OK button is pressed in any display state of the WWW remote interface:

- the channel specific WWW display of the first non-acknowledged alarm is shown if there are non-acknowledged channel specific alarms present (see 4.5.1 Alarm acknowledgement in the WWW remote interface)
- the acknowledgement display of the first non-acknowledged equipment fault is shown if there are no non-acknowledged channel alarms but there are non-acknowledged equipment faults (see 4.6 Equipment fault acknowledgement in the WWW remote interface).
- Pressing the OK button does not change the display mode if there are no non-acknowledged channel alarms nor non-acknowledged equipment faults.

The actual acknowledgement is done with the special acknowledgement buttons on the acknowledgement screens, not with the OK-button.

Two texts telling about the state can be seen on the green part of the WWW screen, below the information table:

- Device state:

OK	No non-acknowledged equipment faults
H	At least one non-acknowledged equipment fault. The acknowledgement screen of the first non-acknowledged equipment fault is shown after pressing the H button (see 4.6 Equipment fault acknowledgement in the WWW remote interface).
- Updated: Time of the last update of the WWW remote interfaces information. The time is taken from the device's internal clock.

The information on the WWW remote interface is updated normally in every few seconds. The exact interval depends on the device type (VRE-08 is the fastest, VRE-64 is the slowest), number of users connected simultaneously to the WWW remote interface, and the speed of the network the VRE device is connected to.

If the time updating stops for a long time (over one minute) it can be assumed that there is either a power fault in the device or the network connection between the device and the remote terminal is broken. After the cause has been repaired the remote interface connection can be automatically re-established in some situations. If this is not the case, the connection can be re-established by refreshing the web-browser.

All the functions of the WWW remote interface explained so far are similar in every display state of the WWW remote interface. The differences between the different display states are in the content of the information table which is located in the top of the green part of the window. In each display mode the information table contains the status information of one or more channel to be studied. This information is updated automatically. When the "updated" time changes all information on the screen has been updated.

The cells of the information table are empty when a new display state has been initiated. This can be easily seen because every cell has a black question mark on a grey background. The question mark disappears and real information appears when the table information has been updated for the first time.

Information table on the WWW main display looks like this:

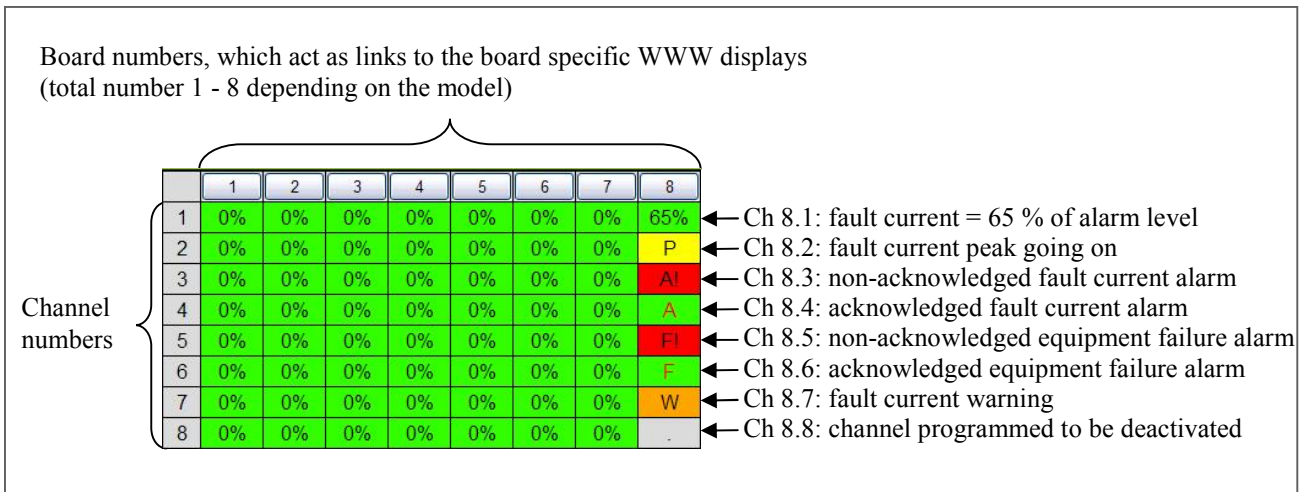


Figure 4.7. Information table of the WWW main display

The state of every channel is shown in the table with a short text and a colour code. The channels are arranged in the table the same way they are in the device's main display. Every vertical column corresponds one measurement board of the device. Every row of the column corresponds one channel of the measurement board. The state of the channel is told by text and colour:

Text	Background colour	Text colour	Channel state
.	grey	black	Channel is programmed to be deactivated.
P	yellow	black	There was a current peak in the supervision point. Duration was less than the alarm delay
A!	red	black	Non-acknowledged fault current alarm on channel.
A	green	red	Acknowledged fault current alarm on channel. Character disappears after the current has decreased under the alarm limit.
F!	red	black	Non-acknowledged equipment failure alarm on channel.
F	green	red	Acknowledged equipment failure alarm on channel. Character disappears after the self testing confirms that the failure has been repaired.
W	orange	black	Fault current warning on channel. Fault current is above the specified warning limit, but below the specified alarm limit. Character disappears when the current has decreased below the warning limit.
0...99%	green	black	There is no special situation going on a channel. Fault current is shown as percentage of the alarm limit.

In case that there are multiple situations going on a channel, the information is shown based on this table. The uppermost row has the highest priority and the lowermost row has the lowest priority.

Channel information can be inspected more specifically on the board specific WWW display. There are board number buttons shown for each measurement board on the top row of the table. Pressing a board number button initiates the board specific WWW display.

4.4 BOARD SPECIFIC WWW DISPLAY

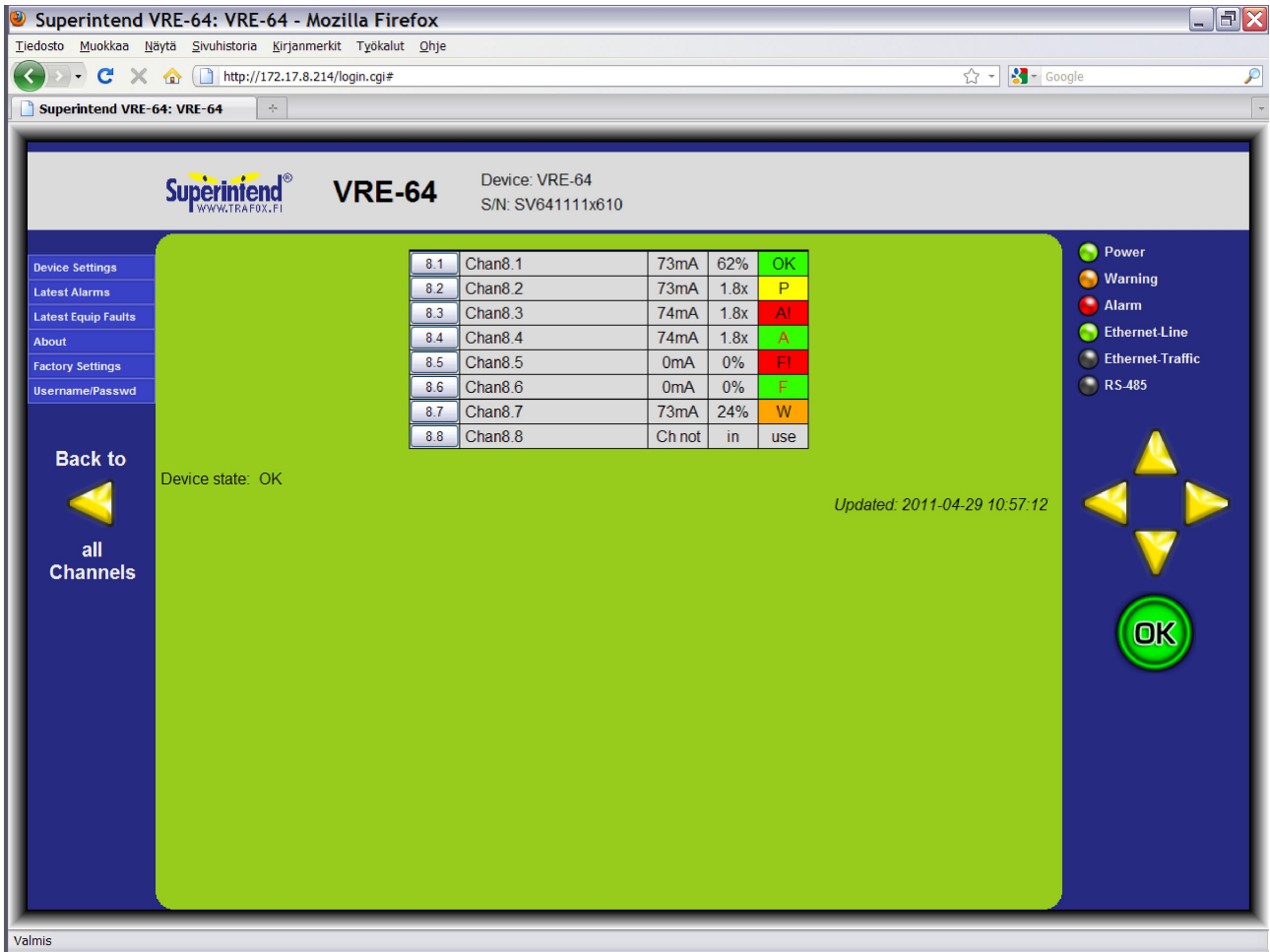


Figure 4.8. Board specific WWW display

The state of one measurement board is shown on the board specific WWW display. The information is more specific than in the WWW main display. Information is shown in a table, which looks like this:

Channel numbers which act as links to the channel specific WWW displays	Channel name	Fault current of the channel	Fault current of the channel as a percentage of the alarm level	Channel state (more specific: see below)	
8.1	Chan8.1	73mA	62%	OK	← Ch 8.1: no special situation going on a channel
8.2	Chan8.2	73mA	1.8x	P	← Ch 8.2: fault current peak going on
8.3	Chan8.3	74mA	1.8x	AI	← Ch 8.3: non-acknowledged fault current alarm
8.4	Chan8.4	74mA	1.8x	A	← Ch 8.4: acknowledged fault current alarm
8.5	Chan8.5	0mA	0%	FI	← Ch 8.5: non-acknowledged equipment failure alarm
8.6	Chan8.6	0mA	0%	F	← Ch 8.6: acknowledged equipment failure alarm
8.7	Chan8.7	73mA	24%	W	← Ch 8.7: fault current warning
8.8	Chan8.8	Ch not	in	use	← Ch 8.8: channel programmed to be deactivated

Figure 4.9. Information table of the board specific WWW display

The channels of one measurement board are listed in the table below each other; one row corresponds one channel. Channel name, current value, current relation to alarm level and the channel status can be seen in every row. Text and colour codes are used to show the information. Status information is shown according to this table:

Text	Background colour	Text colour	Channel state
use	grey	black	Channel is programmed to be deactivated. There is written "Ch not" in the current column and "in" in the relative current column.
P	yellow	black	There was a current peak in the supervision point. Duration was less than the alarm delay
A!	red	black	Non-acknowledged fault current alarm on channel.
A	green	red	Acknowledged fault current alarm on channel. Character disappears after the current has decreased under the alarm limit.
F!	red	black	Non-acknowledged equipment failure alarm on channel.
F	green	red	Acknowledged equipment failure alarm on channel. Character disappears after the self testing confirms that the failure has been repaired.
W	orange	black	Fault current warning on channel. Fault current is above the specified warning limit, but below the specified alarm limit. Character disappears when the current has decreased below the warning limit.
OK	green	black	There is no special situation going on a channel.

In case that there are multiple situations going on a channel, the information is shown based on this table. The uppermost row has the highest priority and the lowermost row has the lowest priority.

Information of one channel can be investigated more specifically in the channel specific WWW display. There are channel number buttons shown for each channel in the first column of each row of the table. Pressing a channel number button initiates the channel specific WWW display.

The measurement board can be changed by pressing the the horizontal arrow keys in the side panel of the WWW remote interface. This doesn't however apply to model VRE-08, as the model has only one measurement board.

There is an arrow key in the left side of the board specific WWW display. This key can be used to get back to the WWW main display where all channels state can be seen.



Figure 4.10. Key to get back from the board specific WWW display to the WWW main display

NOTE: The link buttons on the page are used to navigate through the WWW remote interface. Pressing the "previous page" button of the browser opens the web page which was open in the browser before the WWW remote interface was loaded. The "Previous page" and "Next page" buttons of the browser cannot be used to browse through the WWW remote interface of the VRE device.

4.5 CHANNEL SPECIFIC WWW DISPLAY

Superintend VRE-64: VRE-64 - Mozilla Firefox

Tiedosto Muokkaa Näytä Sivuhistoria Kirjanmerkit Työkalut Ohje

http://172.17.8.214/login.cgi#

Superintend VRE-64: VRE-64

Superintend
WWW.TRAFOX.FI

VRE-64 Device: VRE-64
S/N: SV641111x610

Device Settings
Latest Alarms
Latest Equip Faults
About
Factory Settings
Username/Passwd

Back to
Channels
8.1 - 8.8

Channel 8.1	Chan8.1			
Channel in use:	Yes	Channel testing:	Yes	
Alarm level:	117mA	Alarm delay:	10s	Warning level: Off
Min current:	52mA	44%	@ 2011-04-29 11:04	
Max current:	587mA	5.0x	@ 2011-04-29 11:08	
Latest Min/Max reset:		2011-04-29 11:03		<input type="button" value="Reset Min/Max values"/>

Channel 8.1

Current:	76mA	64%	CHANNEL OK
----------	------	-----	-------------------

Change channel settings

Device state: OK

Updated: 2011-04-29 11:08:48

- Power
- Warning
- Alarm
- Ethernet-Line
- Ethernet-Traffic
- RS-485

OK

Valmis

Figure 4.11. Channel specific WWW display when there is no special situation going on a channel

Settings and status information of one channel are shown in the channel specific display. Here can be seen the most definite data. The channel specific information table contains the next information

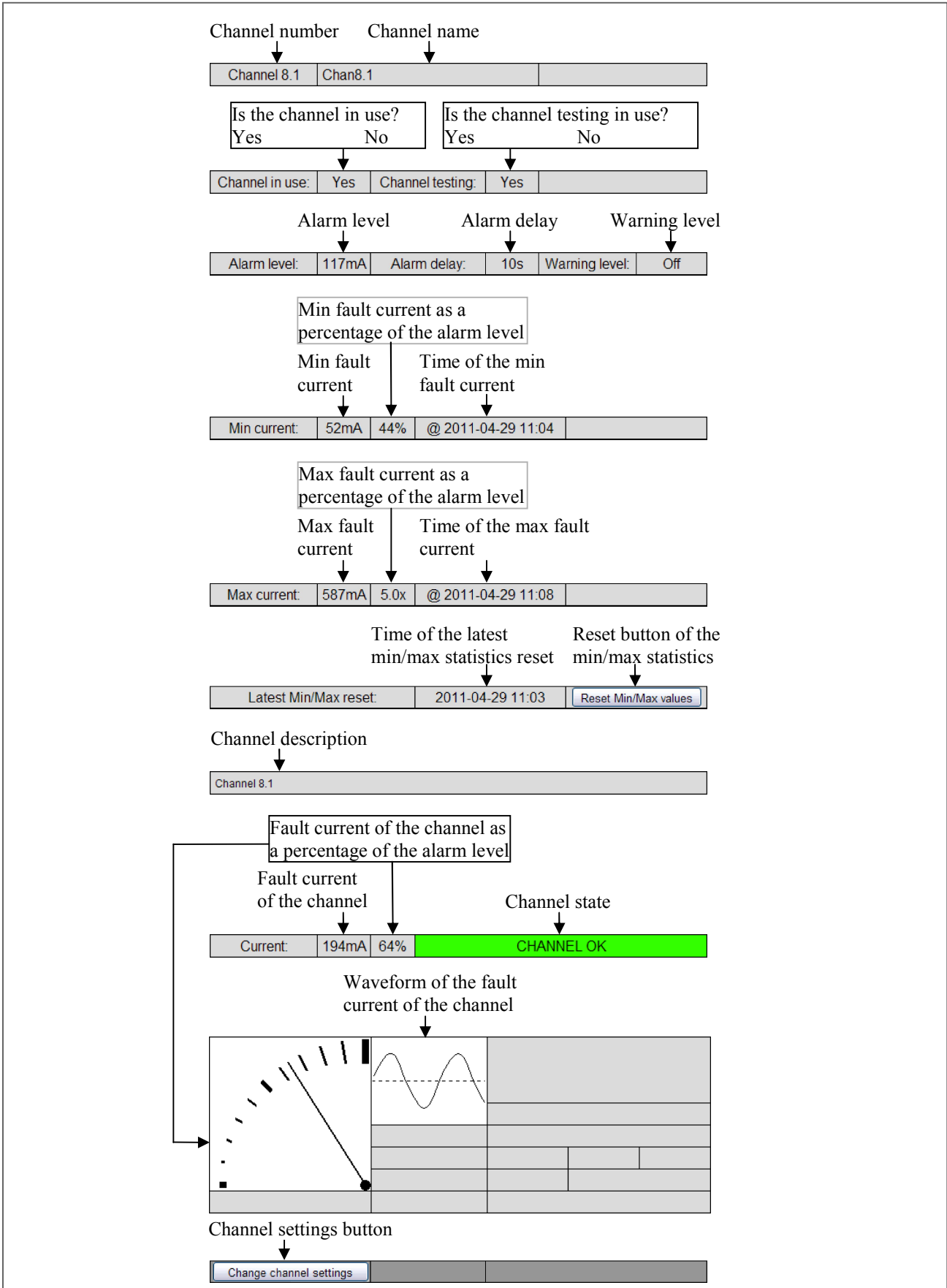


Figure 4.12. Information table of the channel specific WWW display divided into parts

Channel settings are shown on the first three top rows. The settings can be changed by pressing the “Change channel settings” button or from the devices own setting display.

Statistical minimum and maximum current values are shown on the next rows. In both cases the currents percentage of the alarm limit and the duration time of the current are shown in addition to the current value. Statistical data can be reset by pressing the “Reset Min/Max values” button. The time of the latest reset is shown on the table. If the statistics of the channel have never been reset the time information cell is empty.

Channel description is shown under the statistics. The channel description is hard-coded in this software version and it cannot be changed.

The momentary fault current of the channel, currents percentage of the alarm limits and the channel status are shown below the channel description. The text and colour of the information cell is made according to the table below:

Text	Background colour	Text colour	Channel state
Channel not in use	grey	black	Channel is deactivated from program. Momentary current value and percentage of alarm limit are not shown.
PEAK FAULT CURRENT	yellow	black	Current peak in a supervision point. Duration is less than alarm delay.
FAULT CURRENT ALARM!	red	black	Non-acknowledged fault current alarm on channel.
FAULT CURRENT ALARM	green	red	Acknowledged fault current alarm on channel. The state disappears after the current has decreased under alarm limit.
HIGH TEST CURRENT!	red	black	Non-acknowledged equipment failure alarm on channel, caused by too big current in the self test.
HIGH TEST CURRENT	green	red	Acknowledged equipment failure alarm on channel, caused by too big test current. State disappears after self test confirms that failure has been repaired.
LOW TEST CURRENT!	red	black	Non-acknowledged equipment failure alarm on channel, caused by too small current in self test.
LOW TEST CURRENT	green	red	Acknowledged equipment failure alarm on channel, caused by too small test current. State disappears after self test confirms that failure has been repaired.
FAULT CURRENT WARNING	orange	black	Fault current warning on channel. Current is above the warning level but below the alarm limit. The state disappears when the current has decreased under the warning limit.
CHANNEL OK	green	black	No special situation going on a channel.

In case that there are multiple situations going on a channel, the information is shown based on this table.. The uppermost row has the highest priority and the lowermost row has the lowest priority.

There is a virtual analogue meter showing the current relation to the alarm limit in the lower left corner of the information table. When the current is below the alarm level the position of the needle tells the fault currents percentage of the alarm limit: Horizontal position is 0 % and vertical position is 100 % current. The needle stays at vertical position when the current is over the alarm limit. The needle is not shown if the channel has been deactivated.

Waveform of the current is shown on the right side of the virtual analogue meter. Horizontal axis represents time and vertical axis represents the momentary fault current. The dashed horizontal line represents the zero level of the fault current.

A period for about 33 milliseconds is shown at one time. Waveform is scaled vertically in relation to the alarm level. Waveform graph fills all the reserved space vertically when the current is sinusoidal and as big as the alarm level. The peaks will be cut off if the current is bigger than the alarm level.

Waveform is empty if there has not been a measurable current on channel or the channel has been disabled.

The shown channel can be changed by using the arrow keys in the side panel of the WWW remote interface: Pressing the vertical keys changes the channel to be measured. Pressing the horizontal keys changes the selected measurement board. Model VRE-08 has only one measurement board, so pressing the horizontal keys with this model doesn't do anything.

There is an arrow key in the left border of the channel specific WWW-display. Pressing the button returns the view back to the board specific WWW display of the selected channel.



Figure 4.13. Key to get back from the channel specific WWW display to the board specific WWW display

NOTE: The link buttons on the page are used to navigate through the WWW remote interface. Pressing the “previous page” button of the browser opens the web page which was open in the browser before the WWW remote interface was loaded. The “Previous page” and “Next page” buttons of the browser cannot be used to browse through the WWW remote interface of the VRE device.

4.5.1 ALARM ACKNOWLEDGEMENT IN THE WWW REMOTE INTERFACE

When there is an alarm going on a channel, more specific information is shown in the lower right corner of the information table.:

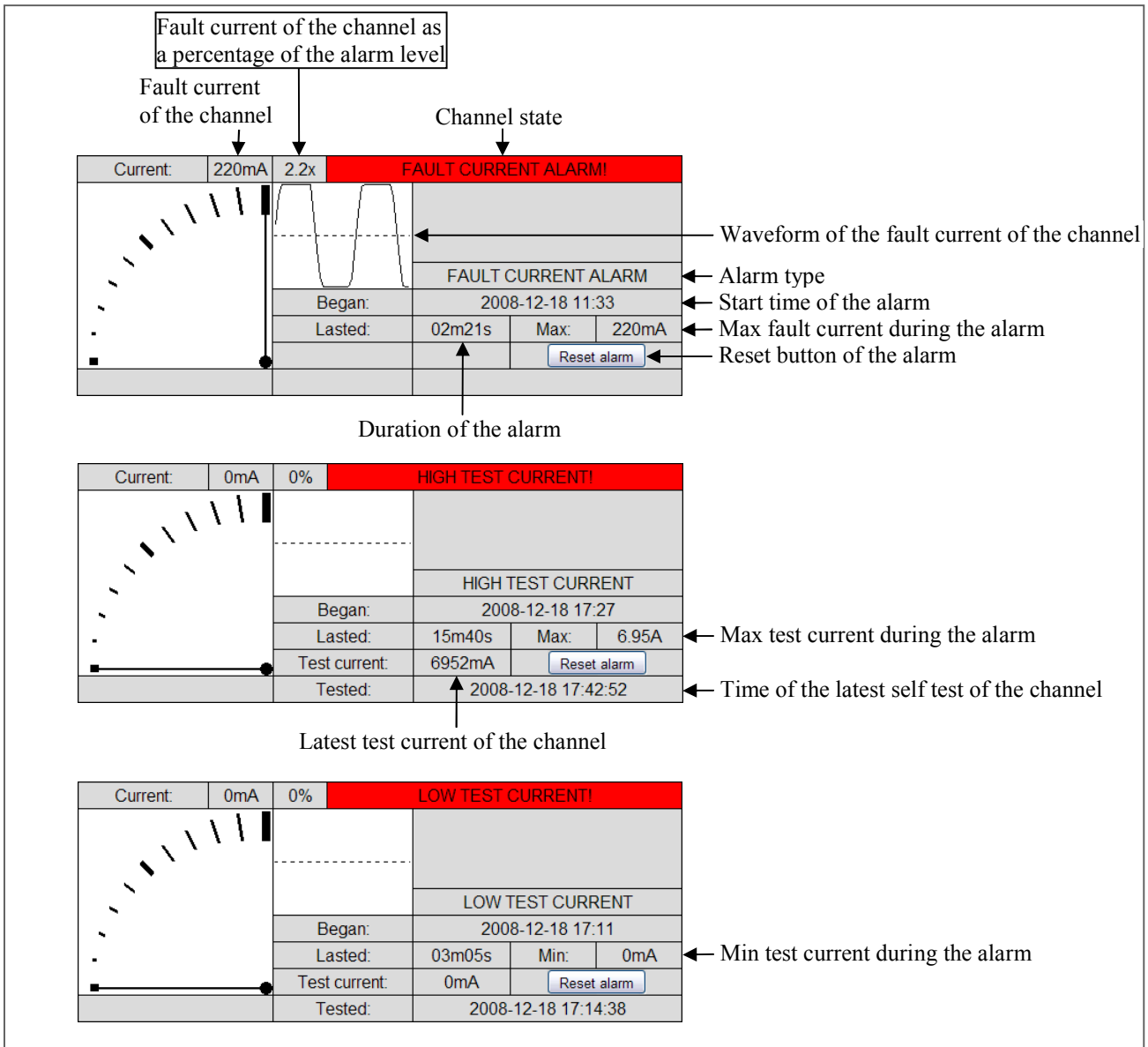


Figure 4.14. Alarm partition of the information table in different alarm situations

Alarm type, start time, duration and min/max current value depending on the alarm type are shown in the alarm partition. The maximum current value during the alarm is shown in the case of a fault current alarm. The maximum value of the test current is shown in the case of a high test current. The minimum value of the test current is shown in the case of a low test current alarm.

Also the latest measured test current and last time of testing are shown in the case of test current alarms.

Alarm can be acknowledged in the WWW remote interface by pressing the "Reset alarm" button in the alarm partition. The partition will look like this after acknowledgement:

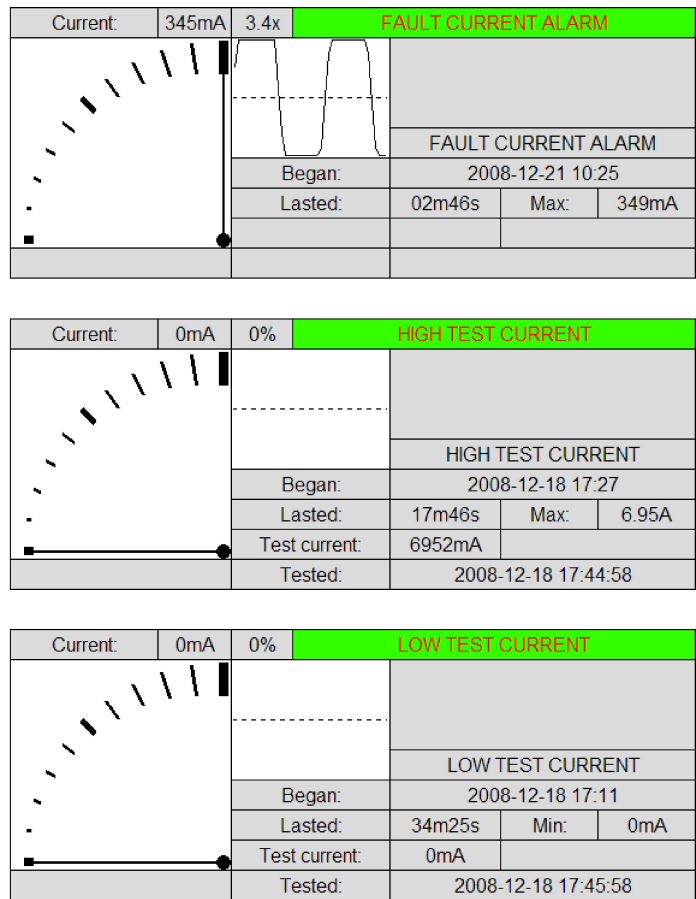


Figure 4.15. Alarm partition of the information table in different acknowledged alarm situations

Channel stays at the acknowledged alarm state until the cause of the alarm has gone. When the alarm state has ended, the channel state becomes “Channel OK” and the alarm partition goes empty.

Also information about other special situations than alarms is shown in the alarm partition:

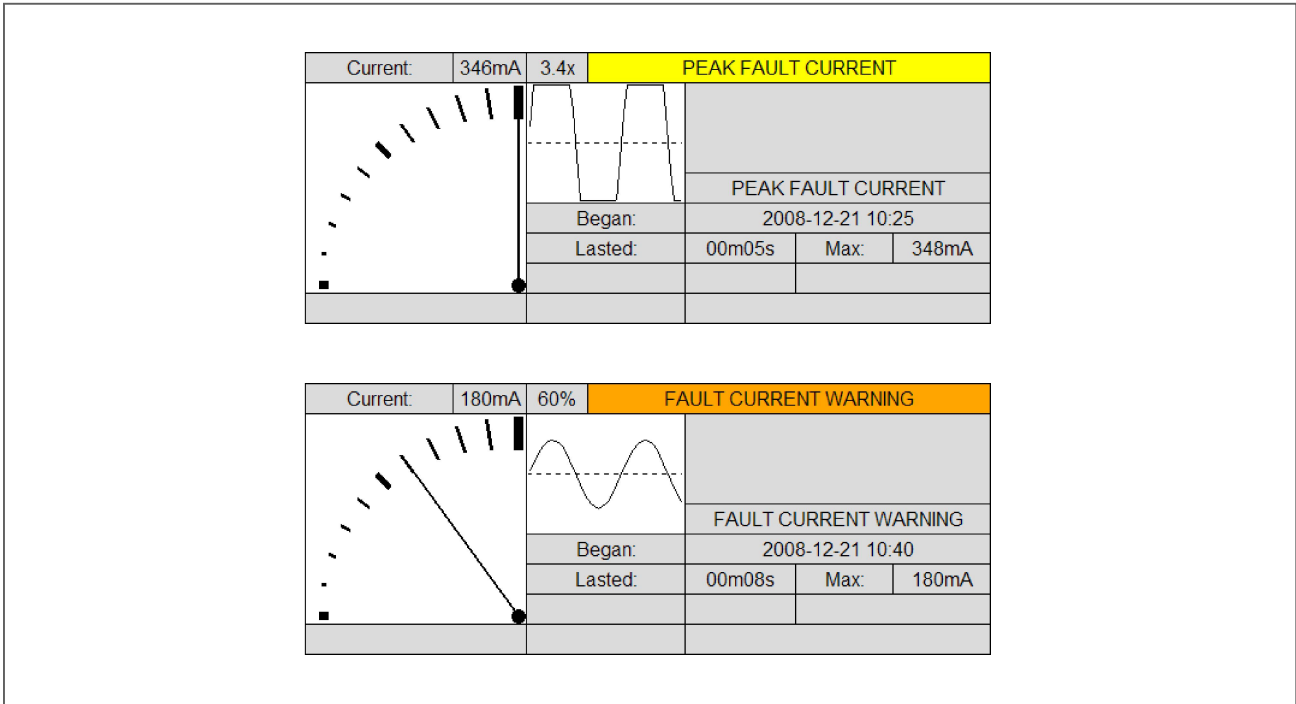


Figure 4.16. Alarm partition of the information table in the case of fault current peak and warning

In these cases the same information is shown on the alarm partition than in the case of a fault current alarm. These situations don't need acknowledging so there is no acknowledgement button visible.

4.5.2 CHANGING OF CHANNEL SETTINGS IN THE WWW REMOTE INTERFACE

Channel settings editing mode is initiated by pressing the "Change channel settings"-button in the bottom row of the information table (see Figure 4.11).

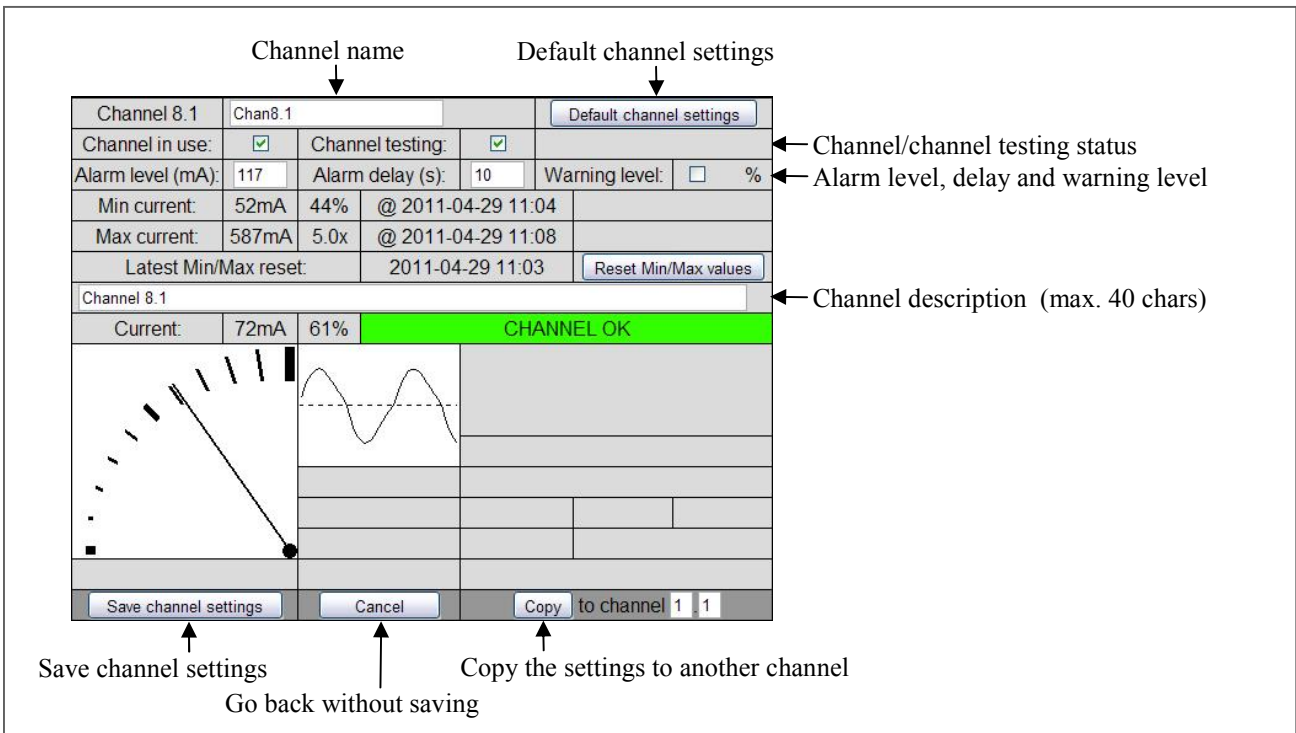


Figure 4.17. Information table of the channel specific WWW-display during the editing mode

New settings can be written in the cells of the information table when in the editing mode. Length of the channel name can be 1-12 characters and the channel description length can be 1-40 characters. The next characters are available to be used in the name fields:

space ! " # \$ % & ' () * + , - . / 0...9 : ; < = > ? @ A...Z [\] ^ _ ` a...z { | } ~

Default settings for each channel are retrieved to the table by pressing the "Default channel settings" button. Warning level can be set after the warning level tick box has been selected. A brief introduction for each setting can be seen when the mouse cursor is moved over the setting field for a moment.

The settings for the channel can be saved by pressing the "Save channel settings" button. Saving can be done only if all of the settings are within specified limits. If some setting is outside the specified limits or there are illegal characters in the name fields, then the corresponding field changes its colour to red and the saving is not done.

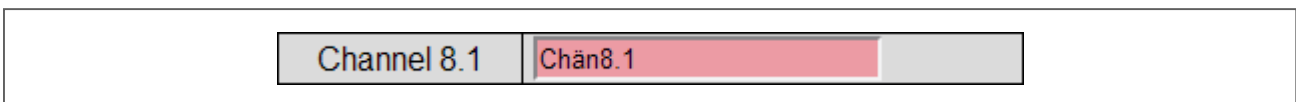


Figure 4.18. Illegal channel name.

The red colour disappears when the field is clicked with mouse. After all of the settings are within the specified limits, the system asks for Administrator password:

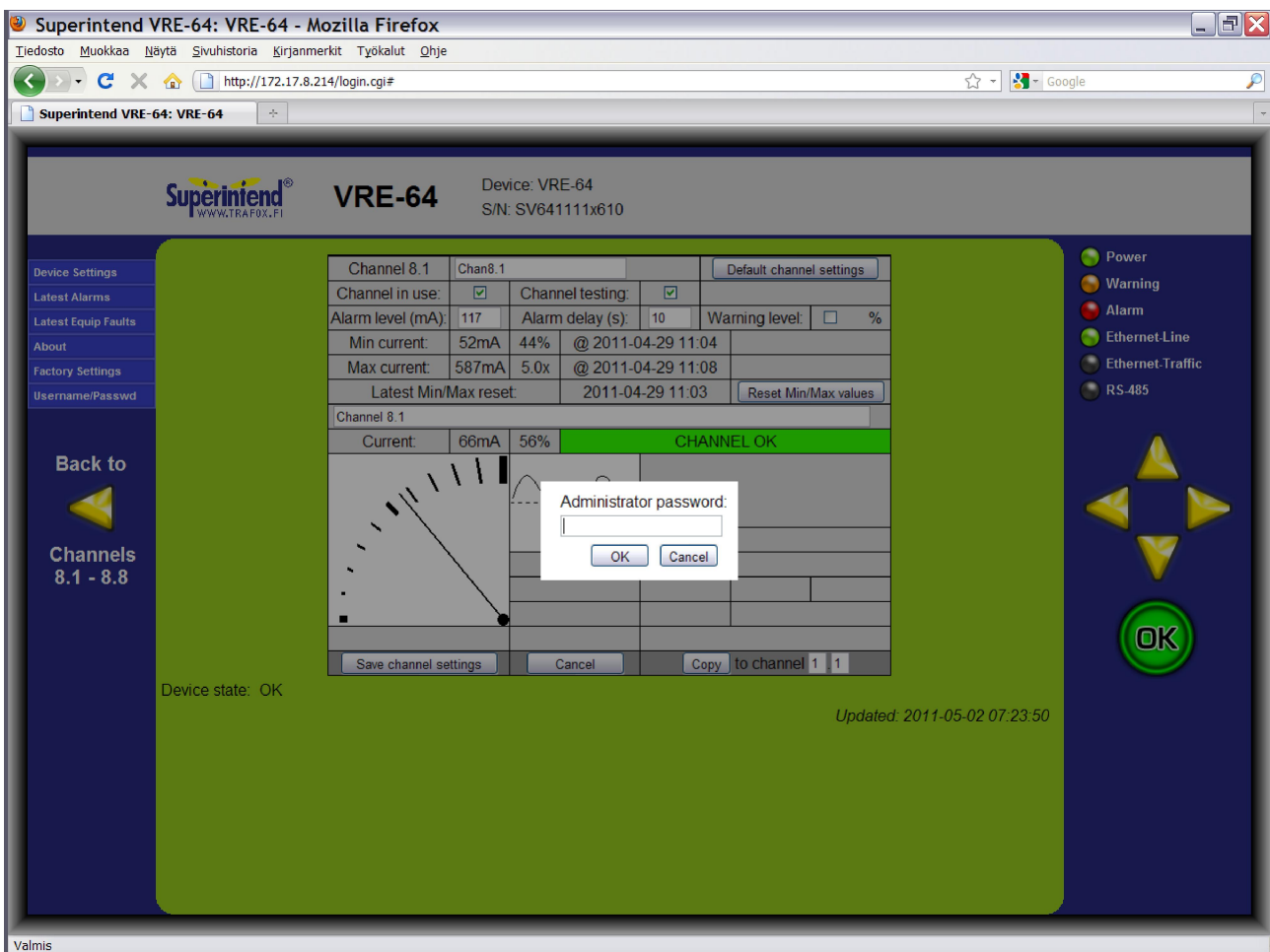


Figure 4.19. System asks for Administrator password when the settings are being saved.

System asks for the password again in case the user gives a wrong password. System saves the settings after user has given the correct Administrator password. See sections 3.8.6 (WWW setup display) and 4.12 (Settings display for setting the user name and passwords in the WWW remote interface) for setting the password.

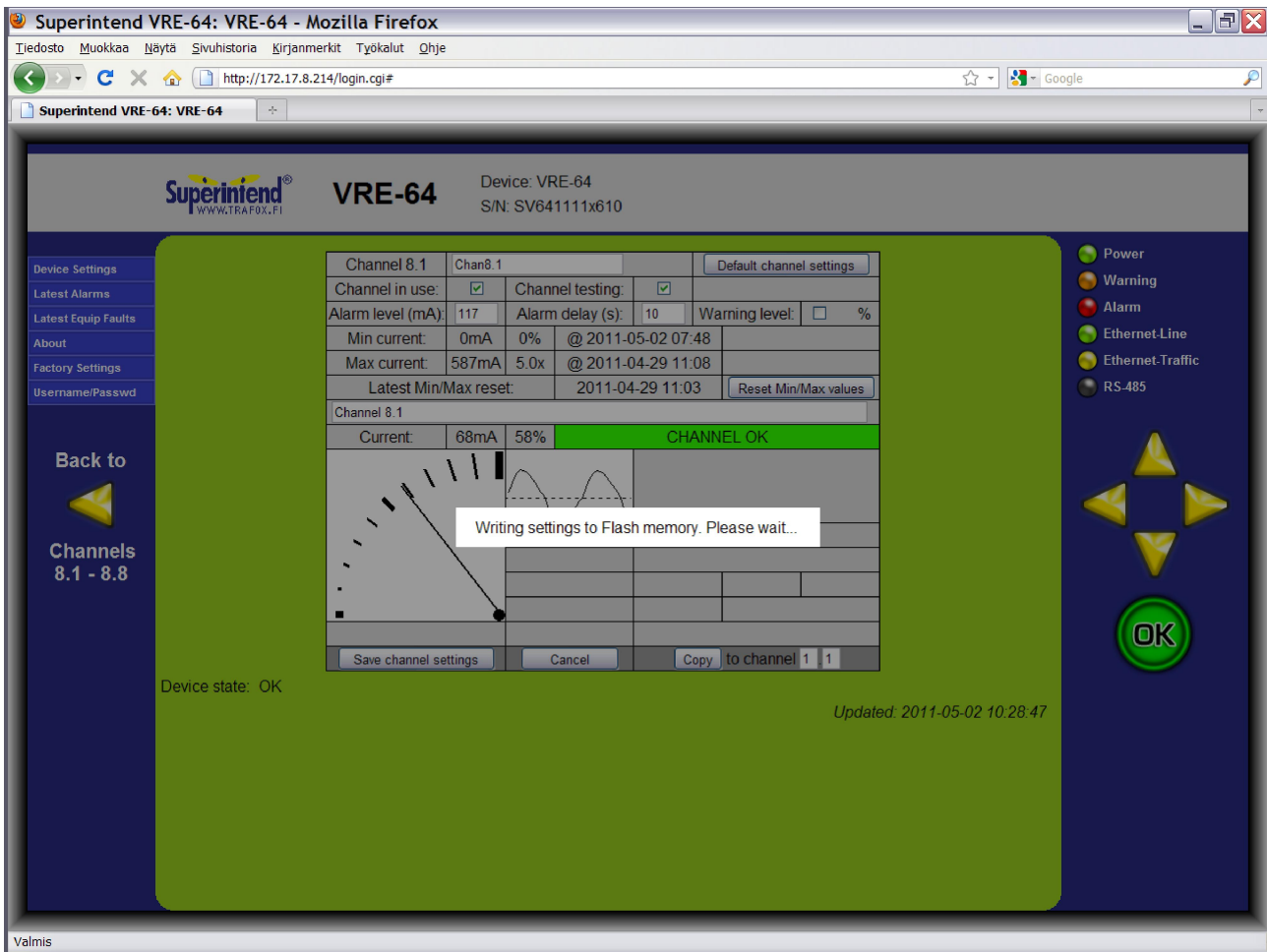


Figure 4.20. Saving of the channel settings is in progress.

After saving the WWW remote interface goes back to normal channel specific display.

The values that have been put into the tables can also be copied to some other channel. This is done by putting the desired destination channel number in the "to channel" field, that is in the right side of the display. After that "Copy" button is pressed. Copying is done the same way as saving – the settings are saved for the destination channel after the user has given the correct password. After copying has been done the WWW remote interface goes back to the channel specific display.

By pressing the "Cancel" button it is possible to go back to the channel specific display without modifying the channel settings.

4.6 EQUIPMENT FAULT ACKNOWLEDGEMENT IN THE WWW REMOTE INTERFACE

When there is at least one non-acknowledged equipment fault in the device, there is a button with letter H next to the text "Device state" on the WWW remote interface. Pressing the button initiates the equipment fault acknowledgement display:

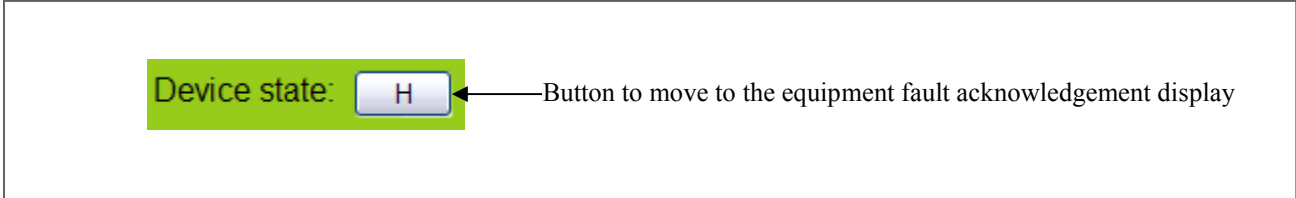


Figure 4.21. Button to move to the equipment fault acknowledgement display of the WWW remote interface

The button text is a "H!" with an exclamation mark if some of the non-acknowledged equipment faults is of alarm causing type (other than power fault).

The equipment fault acknowledgement display is initiated by pressing the H button or pressing the OK button in the side panel (when there are no active fault current alarms nor equipment fault alarms).

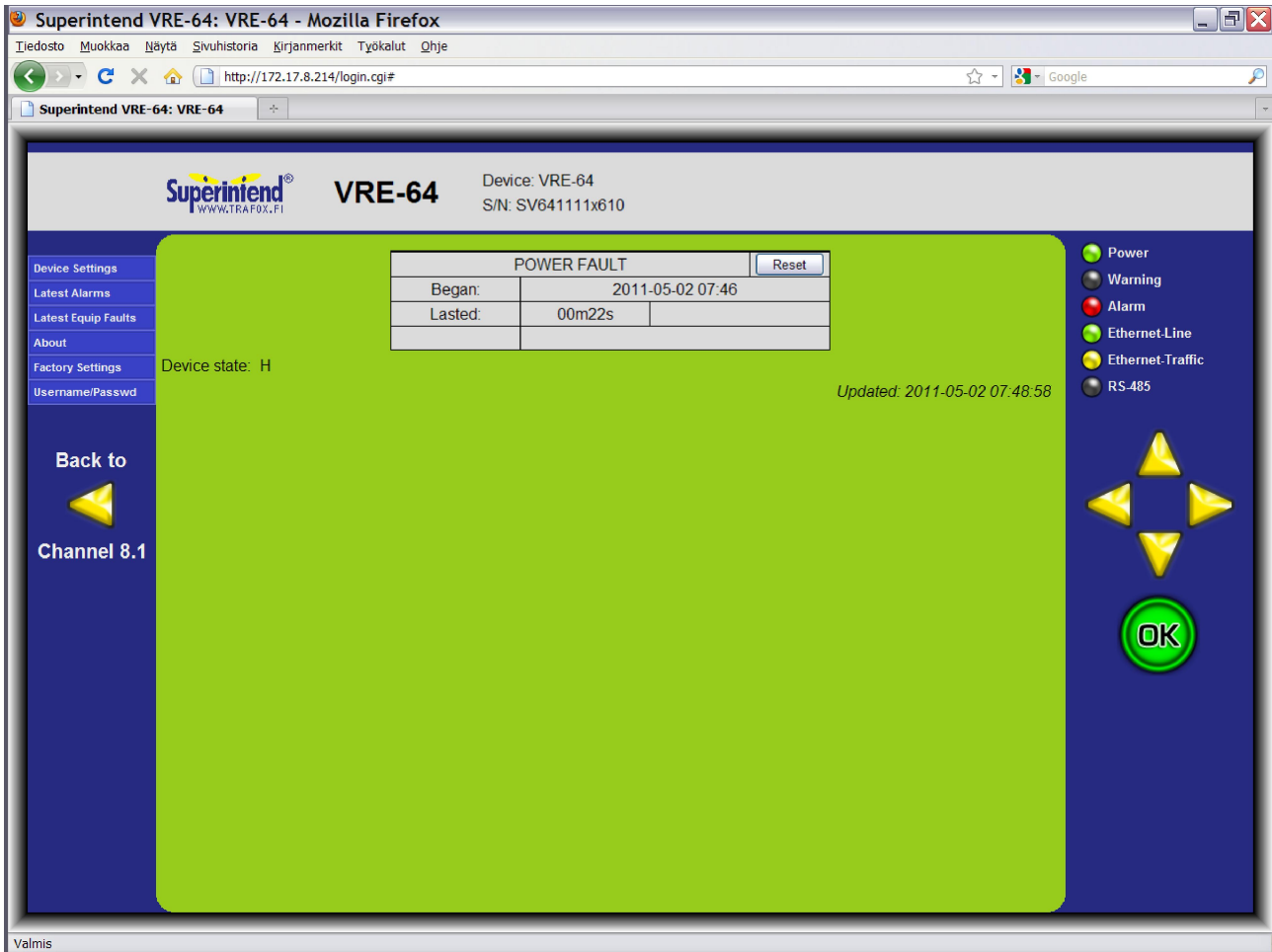


Figure 4.22. Equipment fault acknowledgement display of the WWW remote interface

Information of the equipment fault is shown on the table on the acknowledgement display:

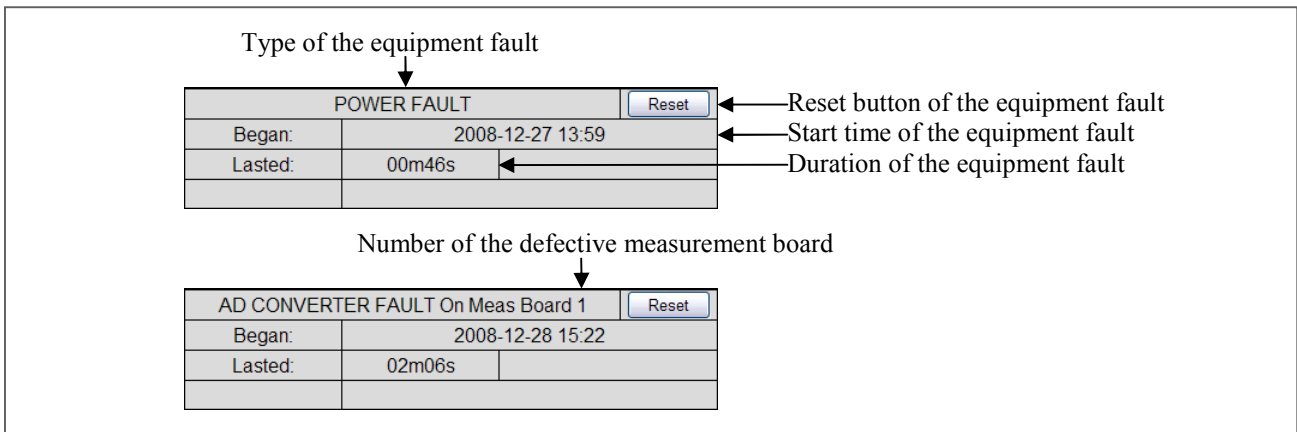


Figure 4.19. Information table of the equipment fault acknowledgement display

Type of the equipment fault is told in the information table. If the fault is measurement board related, the number of the measurement board in fault is shown also. The start time and duration of the fault are shown, too.

Equipment fault can be acknowledged in the WWW remote interface by pressing the Reset button on the equipment fault acknowledgement display. After the fault has been acknowledged the acknowledgement display of the next non-acknowledged equipment fault is shown. The view is returned to the display that was open before initiating the equipment fault acknowledgement display if there are no more non-acknowledged equipment faults.

4.7 DEVICE SETTINGS EDITING DISPLAY IN THE WWW REMOTE INTERFACE

Basic device settings (independent from channels) can be modified by pressing the “Device Settings” button on the settings panel on the left side of the screen (see 4.3 WWW Main display).

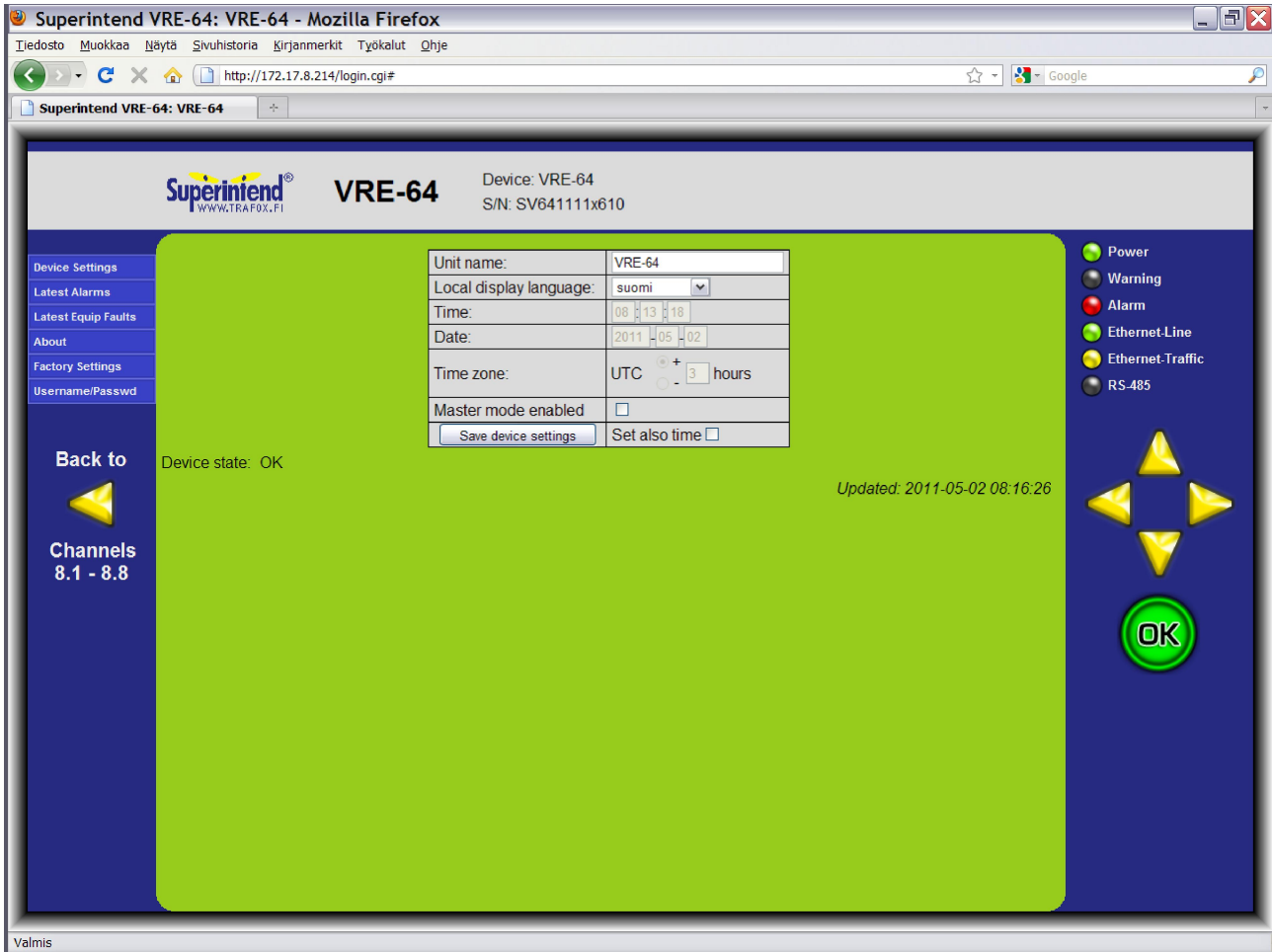


Figure 4.24. Device settings editing display of the WWW remote interface.

Same settings can be modified on the WWW remote display Device Settings display than on the Device setup display of the VRE devices front panel (see section 3.8.1 Device Setup Display).

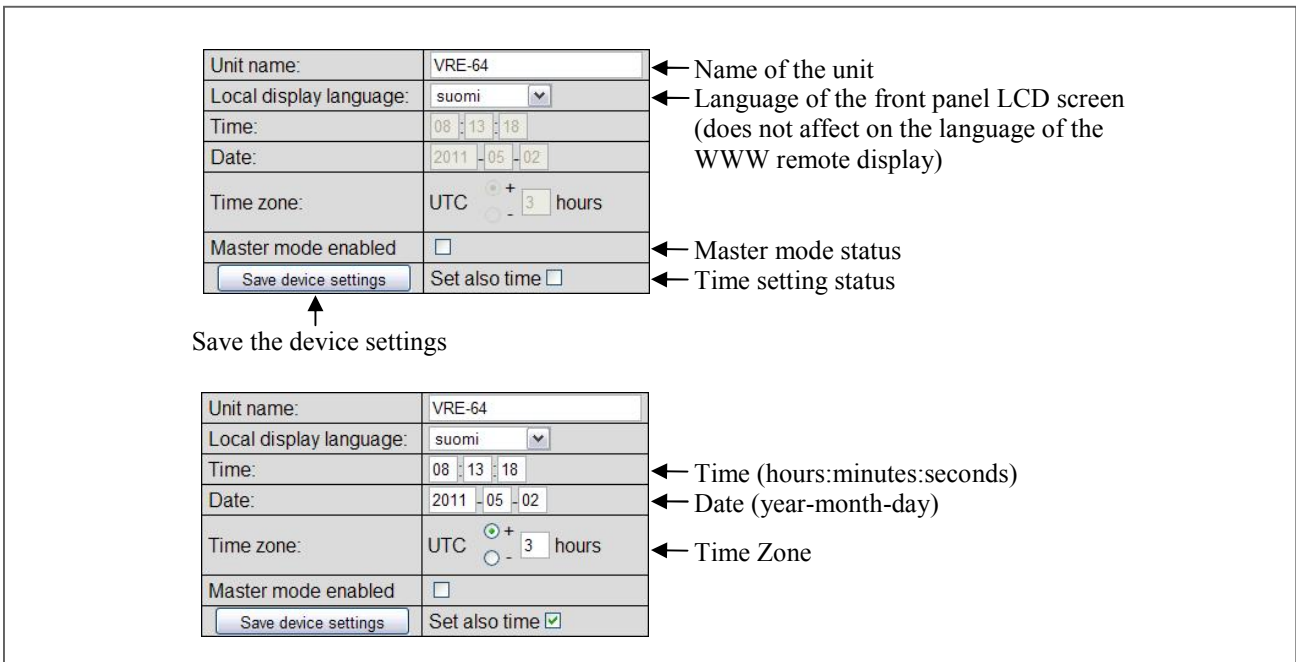


Figure 4.2.5. Information table of the Device settings editing display.

Length of the unit name can be 1 -12 characters. The next characters are available to be used:

space ! ” # \$ % & ’ () * + , - . / 0...9 ; : < = > ? @ A...Z [\] ^ _ ` a...z { | } ~

Language options of the front panel LCD are Finnish (suomi), English and Swedish (svenska). The WWW remote display has a possibility to use Master mode, where maximum of 31 other VRE-08/16/32/64 devices can be monitored on one screen. This option is enabled by selecting the “Master mode enabled” tick box. Additional information can be found from section 4.13 Master display on WWW Remote Interface.

The time, date and time zone of the device can be modified by selecting the “Set also time” tick box. After the “Save device settings” button has been pressed the VRE units internal clock is synchronized to the time values user has put in the fields.

Device settings are saved by pressing the “Save device settings” button. If some setting is outside the specified limits or there are illegal characters in the name field, then the corresponding field changes its colour to red and the saving is not done. The red colour disappears when the field is clicked with mouse. After all of the settings are within the specified limits, the system asks for Administrator password. After the correct administrator password has been given the device saves the settings to memory. The display reverts to the state it was in before the “Device Settings” button was pressed on the screen.

It is possible to get back from the device settings display to the latest main- board- or channel specific WWW display by pressing the Back-button found on the left side of the screen (see section 4.4 Board specific WWW display). Optionally some other setting display can be activated by pressing one of the buttons on the left side of the screen.

4.8 LATEST ALARMS DISPLAY ON THE WWW REMOTE INTERFACE

The latest alarms of the device can be inspected by pressing the “Latest Alarms” button on settings panel on the left side of the screen.

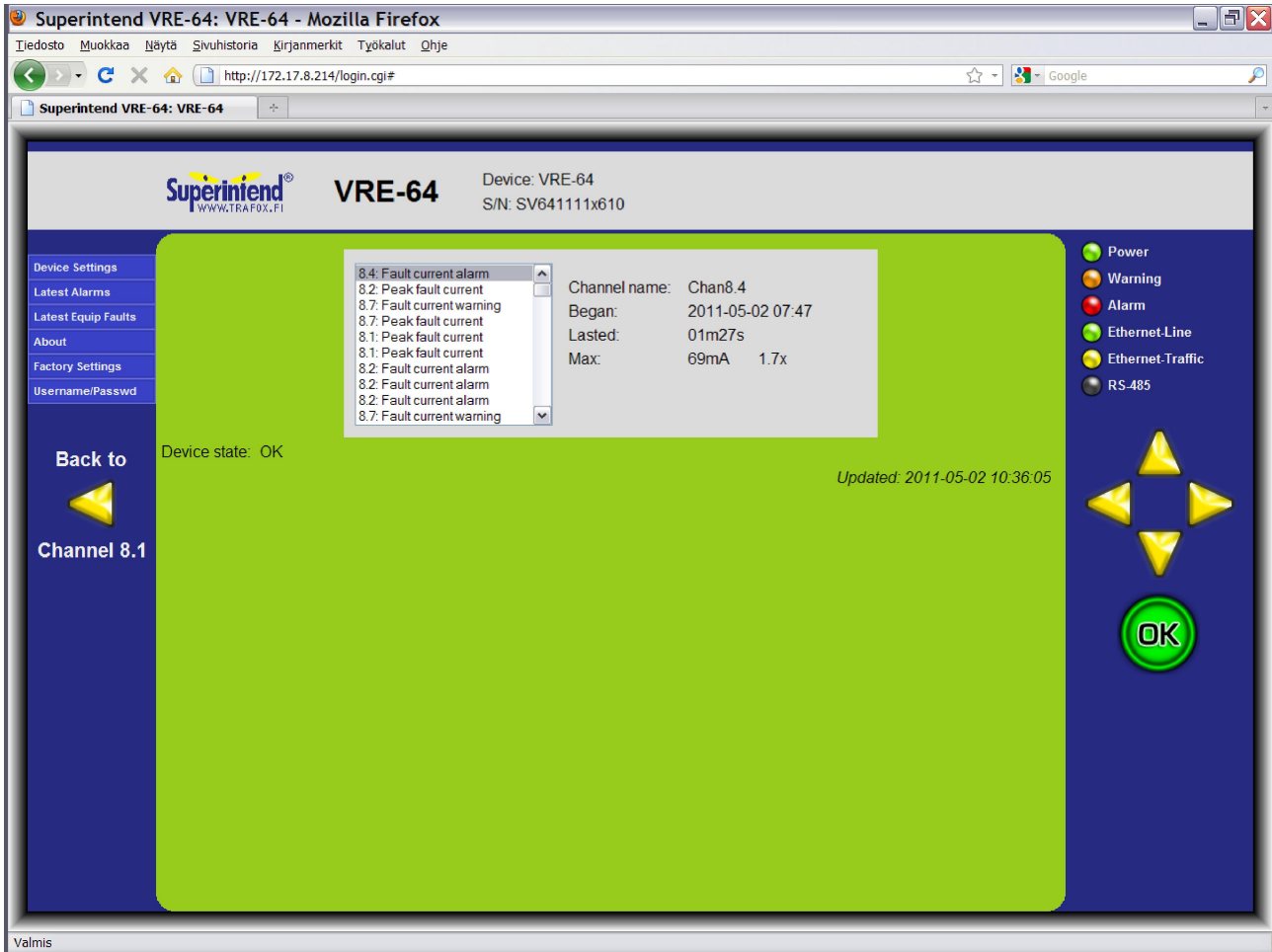


Figure 4.26. Latest Alarms display of the WWW Remote Display.

The Latest Alarms display functions in the same way as the latest alarms list on the LCD screen of the device (see section 3.8.2 Latest Alarms Display).

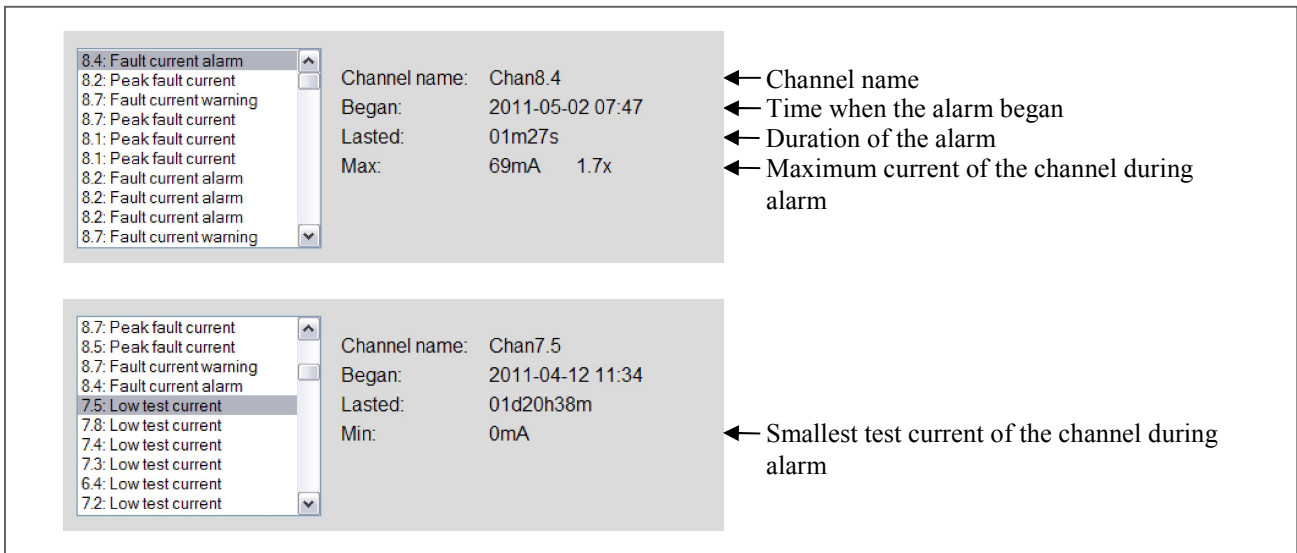


Figure 4.27. Latest alarms information table.

On the right side of the latest alarms list there are shown additional information of the selected alarm. Older alarms can be inspected by scrolling down the list (not in VRE-08, where only 10 latest alarms are shown).

It is possible to get back from the latest alarms display to the latest main- board- or channel specific WWW display by pressing the Back-button found on the left side of the screen (see section 4.4 Board specific WWW display). Optionally some other setting display can be activated by pressing one of the buttons on the left side of the screen.

4.9 LATEST EQUIPMENT FAULTS DISPLAY ON THE WWW REMOTE INTERFACE

Latest equipment faults of the device can be inspected by pressing the “Latest Equip Faults” button on the settings panel on the left side of the screen.

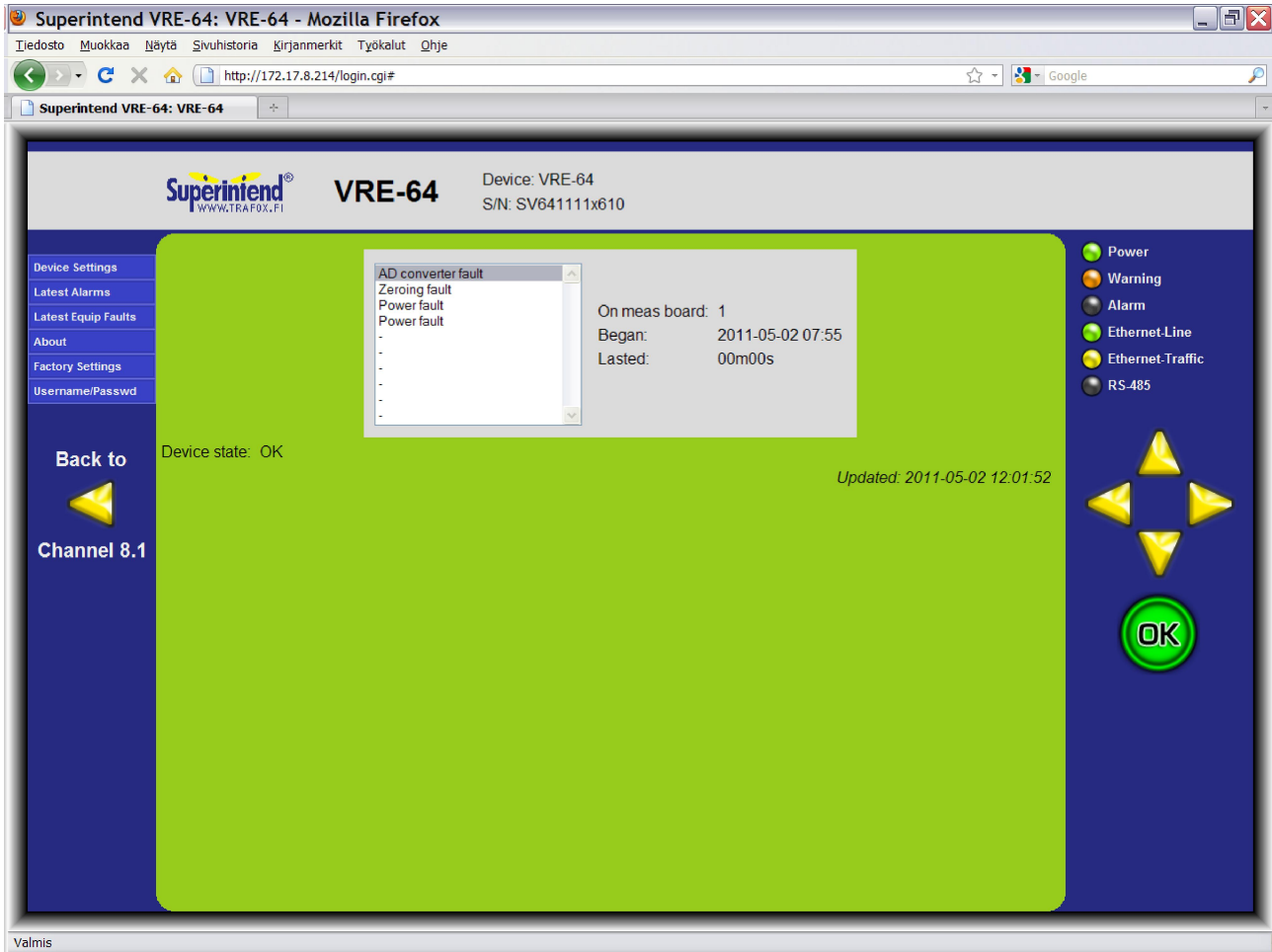


Figure 4.28. Latest Equipment Faults display of the WWW Remote Interface.

The Latest Equipment Faults display functions in the same way as the equipment faults list on the LCD screen of the device (see section 3.8.3 Latest Equipment Faults Display).

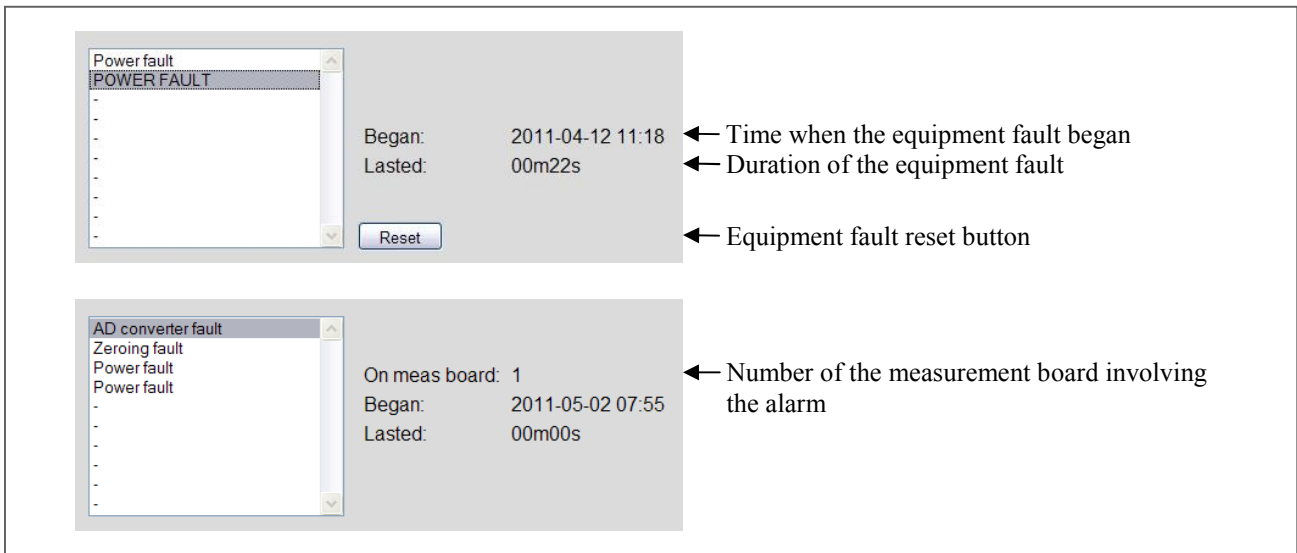


Figure 4.29. Information table of the Latest Equipment Faults.

On the right side of the latest equipment faults list there are shown additional information of the selected alarm. There is a “Reset” button below the additional information in case the fault has not been acknowledged yet. Acknowledgement is done by pressing the “Reset” button.

It is possible to get back from the latest equipment faults display to the latest main- board- or channel specific WWW display by pressing the Back-button found on the left side of the screen (see section 4.4 Board specific WWW display). Optionally some other setting display can be activated by pressing one of the buttons on the left side of the screen.

4.10 THE “ABOUT” DISPLAY ON THE WWW REMOTE INTERFACE

The devices model, identification and status information can be inspected by pressing the “About” button on the information panel on the left side of the screen.

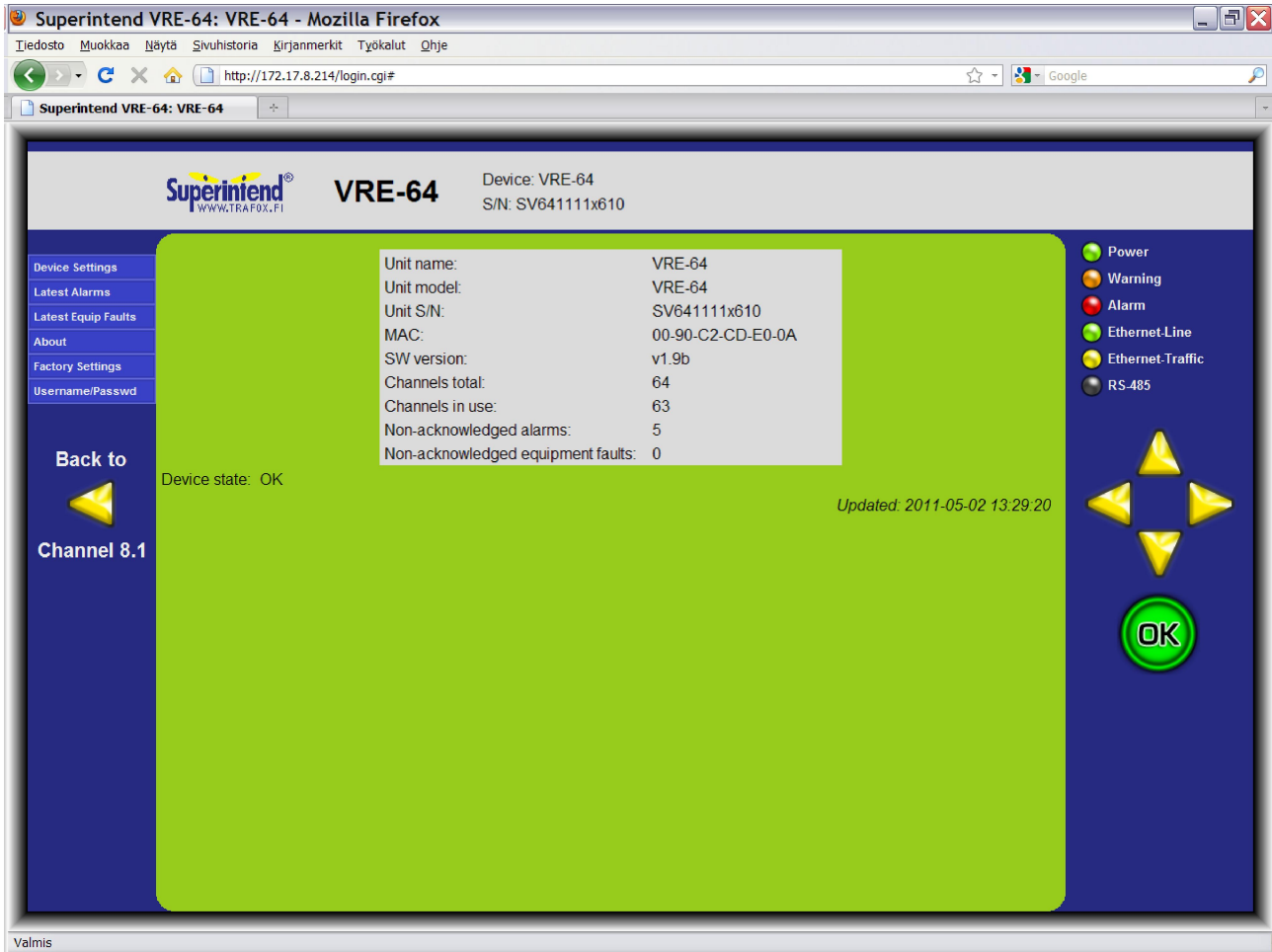


Figure 4.30. The ”About” display on the WWW Remote Interface.

Same information is shown on the About display as on the information display on the devices LCD screen (See section 3.8.4 Information display). More than that also the number of non-acknowledged alarms and equipment faults.

Unit name:	VRE-64	← Unit name
Unit model:	VRE-64	← Unit model
Unit S/N:	SV641111x610	← Unit serial number
MAC:	00-90-C2-CD-E0-0A	← Unit MAC address
SW version:	v1.9b	← Software version
Channels total:	64	← Total channels
Channels in use:	63	← Number of channels in use
Non-acknowledged alarms:	5	← Number of non-acknowledged alarms
Non-acknowledged equipment faults:	0	← Number of non-acknowledged equipment faults

Figure 4.31. Information table of the “About” display.

It is possible to get back from the About display to the latest main- board- or channel specific WWW display by pressing the Back-button found on the left side of the screen (see section 4.4 Board specific WWW display). Optionally some other setting display can be activated by pressing one of the buttons on the left side of the screen.

4.11 FACTORY SETTINGS DISPLAY ON THE WWW REMOTE INTERFACE

On the Factory Settings display of the WWW Remote Interface some or all of the device settings can be reset to default values.

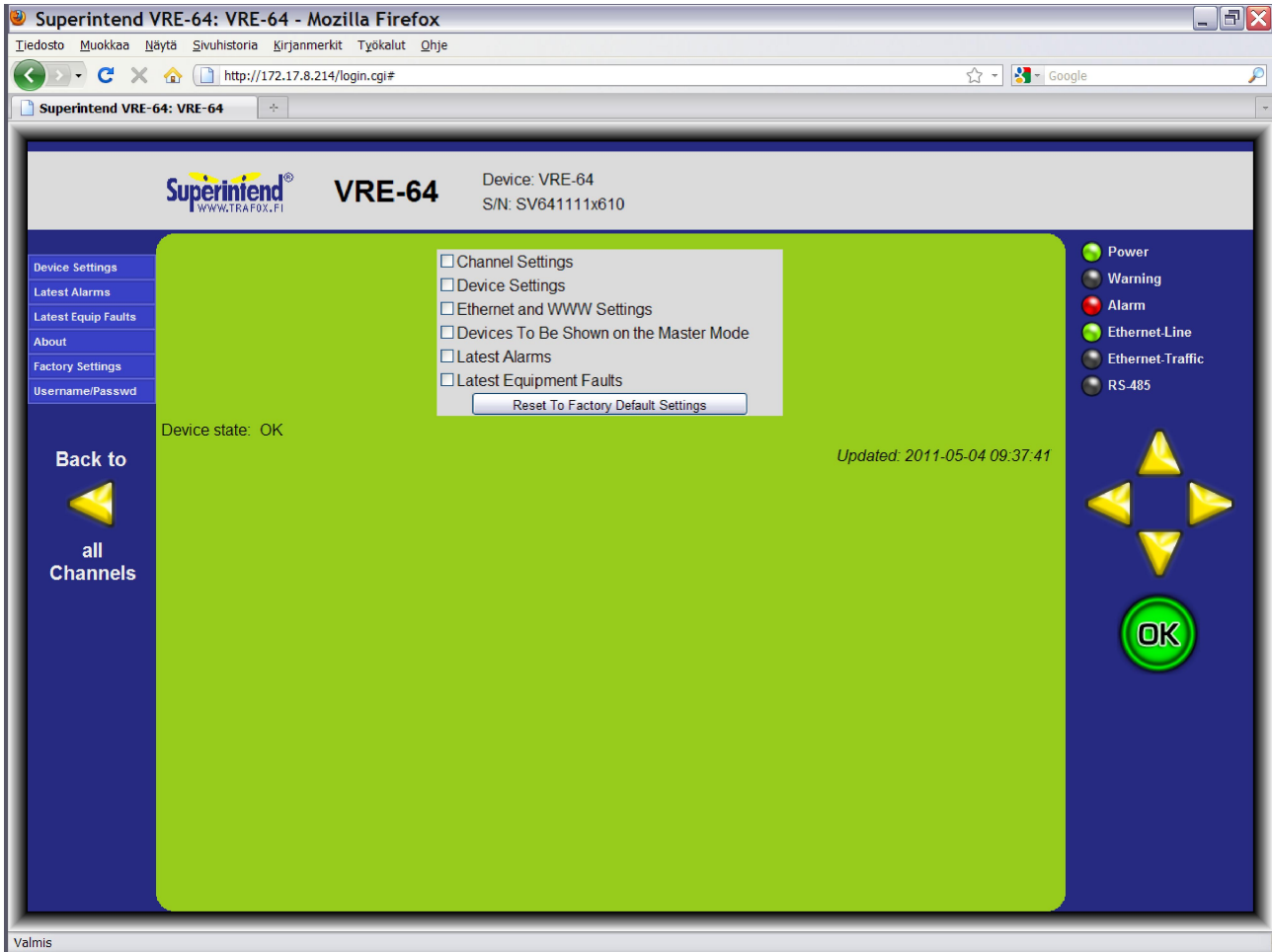


Figure 4.32. Factory Settings Display of the WWW Remote Interface.

Either some of the settings or all of the settings can be reset to the factory defaults. Possible resettable settings are listed in the information table. No settings are selected by default, so the user needs to select all of the settings that need to be reset.

<input type="checkbox"/> Channel Settings	← Settings of all channels
<input type="checkbox"/> Device Settings	← Device settings
<input type="checkbox"/> Ethernet and WWW Settings	← Ethernet and WWW settings
<input type="checkbox"/> Devices To Be Shown on the Master Mode	← Devices shown on the Master Mode
<input type="checkbox"/> Latest Alarms	← Latest Alarms list
<input type="checkbox"/> Latest Equipment Faults	← Latest Equipment Faults list
<input type="button" value="Reset To Factory Default Settings"/>	← Reset the selected settings to factory defaults

Figure 4.33. Factory Settings information table.

- Channel Settings resets all settings of all channels to factory defaults
- Device Settings resets all of the channel independent basic settings except time and date to factory defaults (see section 4.7 Device Settings Editing Display on the Remote Interface)
- Ethernet and WWW settings resets all Ethernet settings (see section 3.8.5 Ethernet Setup Display) and WWW-settings (see section 3.8.6 WWW Setup Display) to the factory defaults

Note! Resetting the Ethernet and WWW Settings to the factory defaults disables both the Ethernet interface and WWW server. After taking this action the connection between WWW browser and VRE device is disconnected. Connection can be re-enabled by setting up the correct Ethernet and WWW Settings on the VRE device's front panel.

- Devices To Be Shown resets the list of the slave devices shown in Master mode
- Latest alarms resets the latest alarms list of the device
- Latest Equipment Faults resets the list of the latest equipment faults

Selected setting can be reset to the factory defaults by pressing the “Reset To Factory Default Settings” button. Administrator password is asked before the saving. After the correct password is given the device resets the selected settings, writes them in the Flash memory and then goes back to the latest display mode where the WWW Remote Interface was before the Factory Settings button was pressed on the settings panel on the left side of the screen.

It is possible to get back from the Factory Settings display to the latest main- board- or channel specific WWW display by pressing the Back-button found on the left side of the screen (see section 4.4 Board specific WWW display). Optionally some other setting display can be activated by pressing one of the buttons on the left side of the screen.

4.12 USERNAME/PASSWORD SETTING ON THE WWW REMOTE INTERFACE

WWW Remote Interface's user name and/or passwords can be edited on the Username/Password setting display.

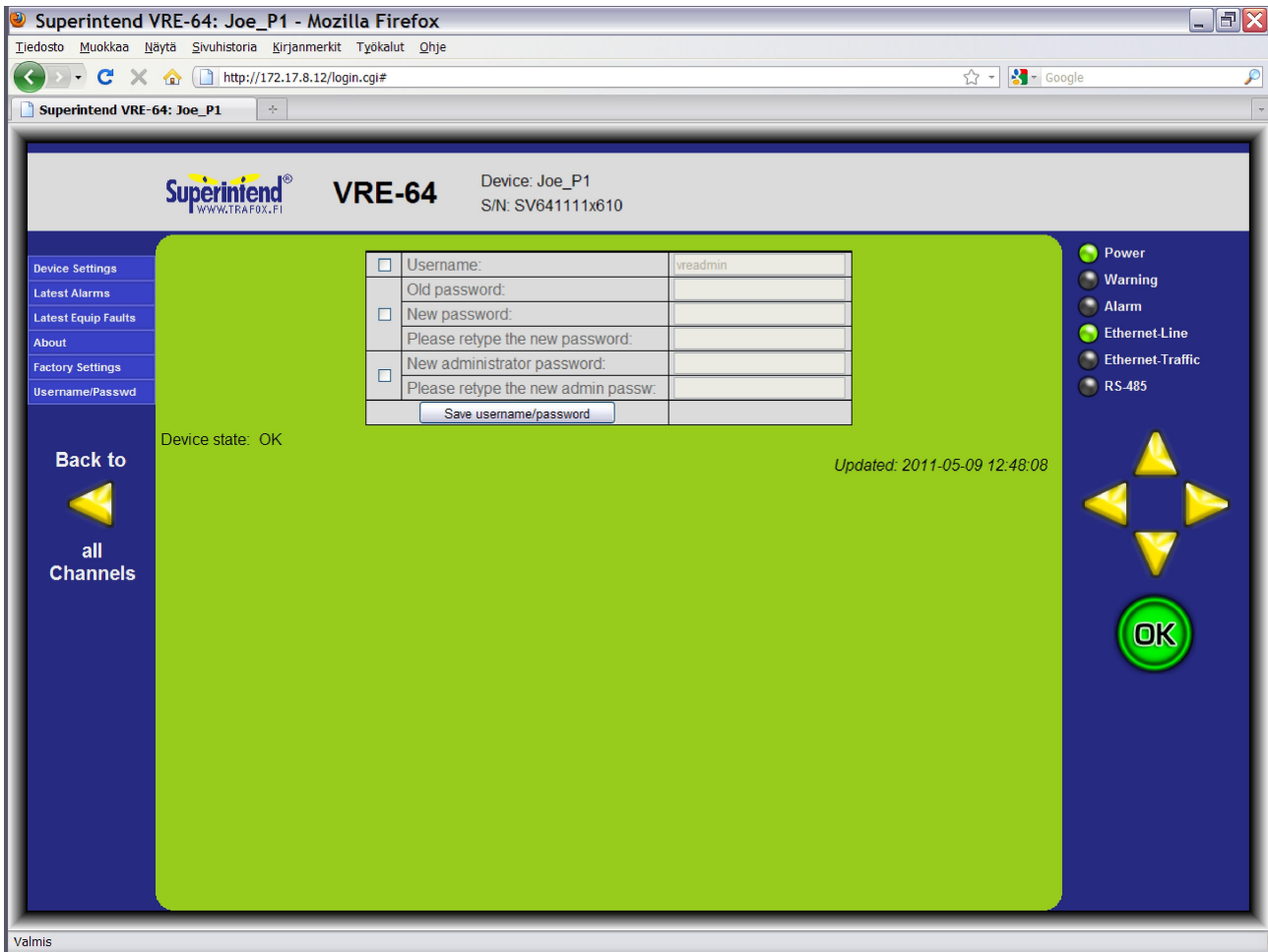


Figure 4.34. Username/Password setting display of the WWW Remote Interface

Information table has fields for username and passwords below each other. The desired to-be-edited settings are selected with the tick boxes on the left side of the table.

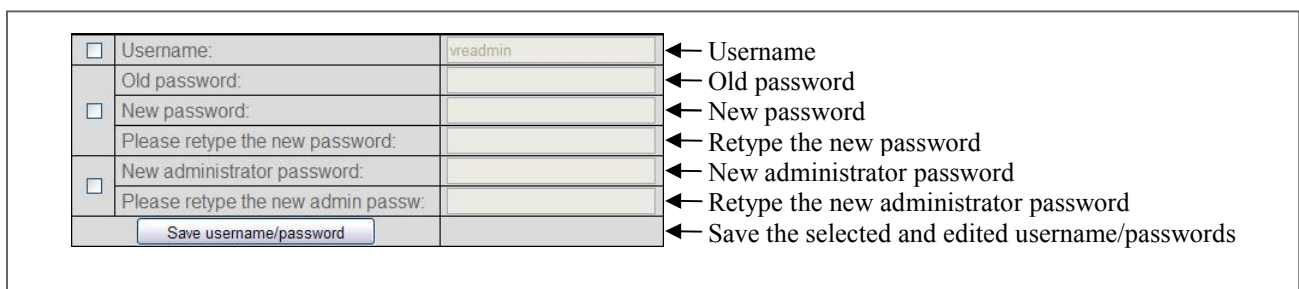


Figure 4.35. Information table of the Username/Password setting display.

Both the username and password can be 1-12 characters in length and can contain characters 0...9, A...Z and a...z. Old password has to be typed in the corresponding field in case the password is going to be changed. New password is confirmed by typing it twice. Also the administrator password has to be typed twice.

New username and passwords are saved for use by pressing the “Save username/password” button. Saving can be done only if there are no illegal characters in username and/or passwords. If the username or passwords contain illegal characters or the retyped password is different from the first password, then the corresponding field changes its colour to red and the saving is not done. The red colour disappears when the field is clicked with mouse. After all the fields have correct information the old administrator password is asked before the saving. After the correct password is given the device saves the selected passwords, writes them in the Flash memory and then goes back to the latest display mode where the WWW Remote Interface was before the Factory Settings button was pressed on the settings panel on the left side of the screen.

It is possible to get back from the Username/password display to the latest main- board- or channel specific WWW display by pressing the Back-button found on the left side of the screen (see section 4.4 Board specific WWW display). Optionally some other setting display can be activated by pressing one of the buttons on the left side of the screen.

4.13 MASTER MODE DISPLAY ON THE WWW REMOTE INTERFACE

It is possible to inspect maximum of 31 Slave devices on the Master mode display in addition of the Master device. All VRE-08/16/32/64 devices with software version similar or greater than v1.9b can be used as Slave devices. Before Master mode can be used it has to be enabled first either on the WWW settings display (see section 3.8.6 WWW Setup Display) or on the Device Settings display of the WWW Remote Interface (see section 4.7 Device Settings editing display on the WWW Remote Interface), Master display is initiated by pressing the “All devices” button on the top device information bar on the screen.

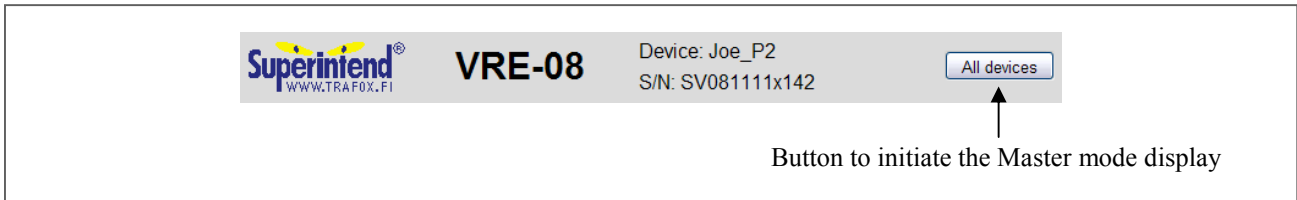


Figure 4.36. Button for initiating the Master mode display.

Device goes to Master mode after the “All devices” button has been pressed. After that all of the Slave devices that have been added in the Master device settings are shown on the screen.

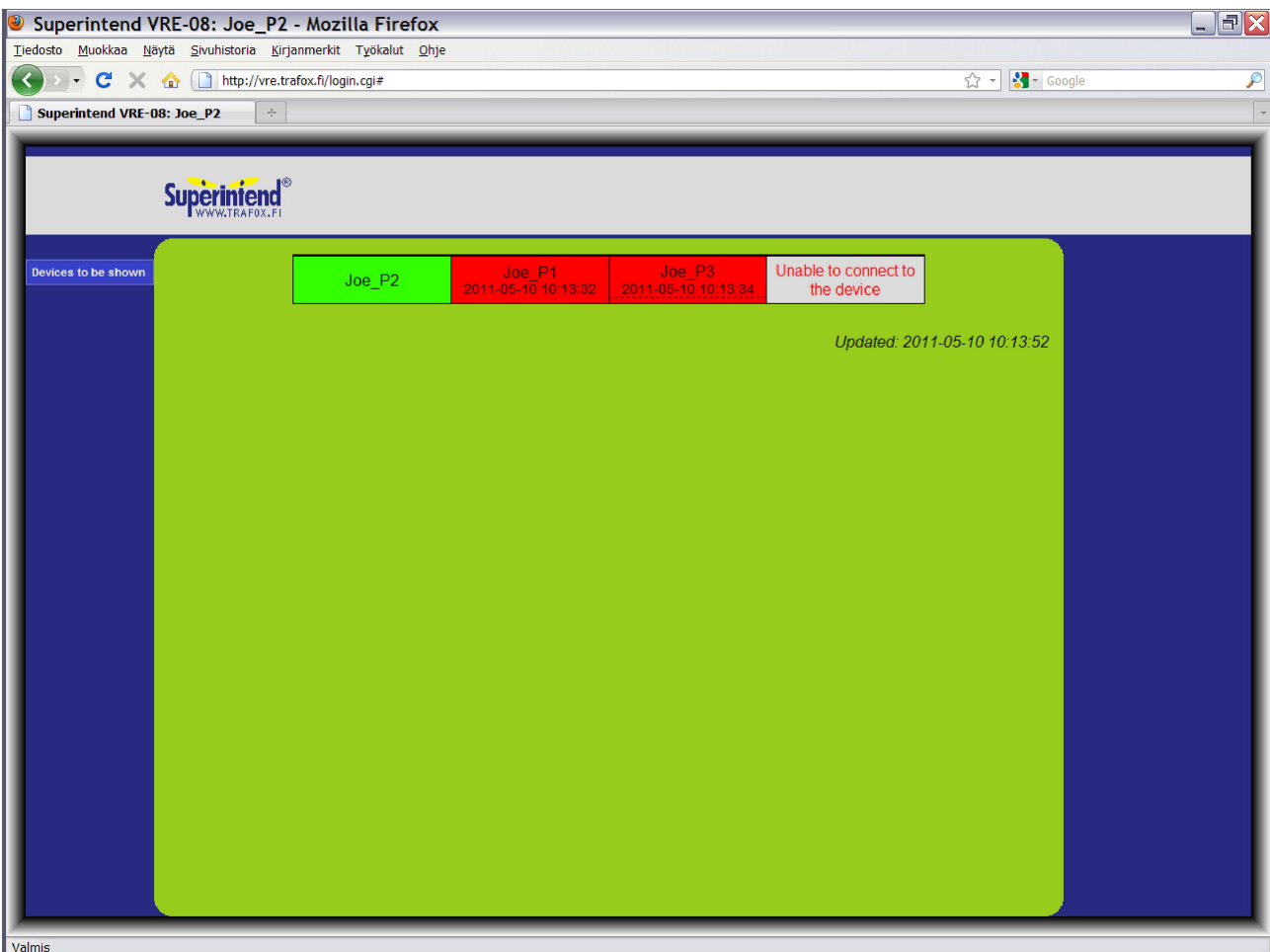


Figure 4.37. Master mode display with three Slave devices.

In the Master mode display the devices are shown in a table which has one cell per each device. The leftmost device of the top row is the Master device. If there are no Slave devices added to the settings, only the Master device is shown on the table.

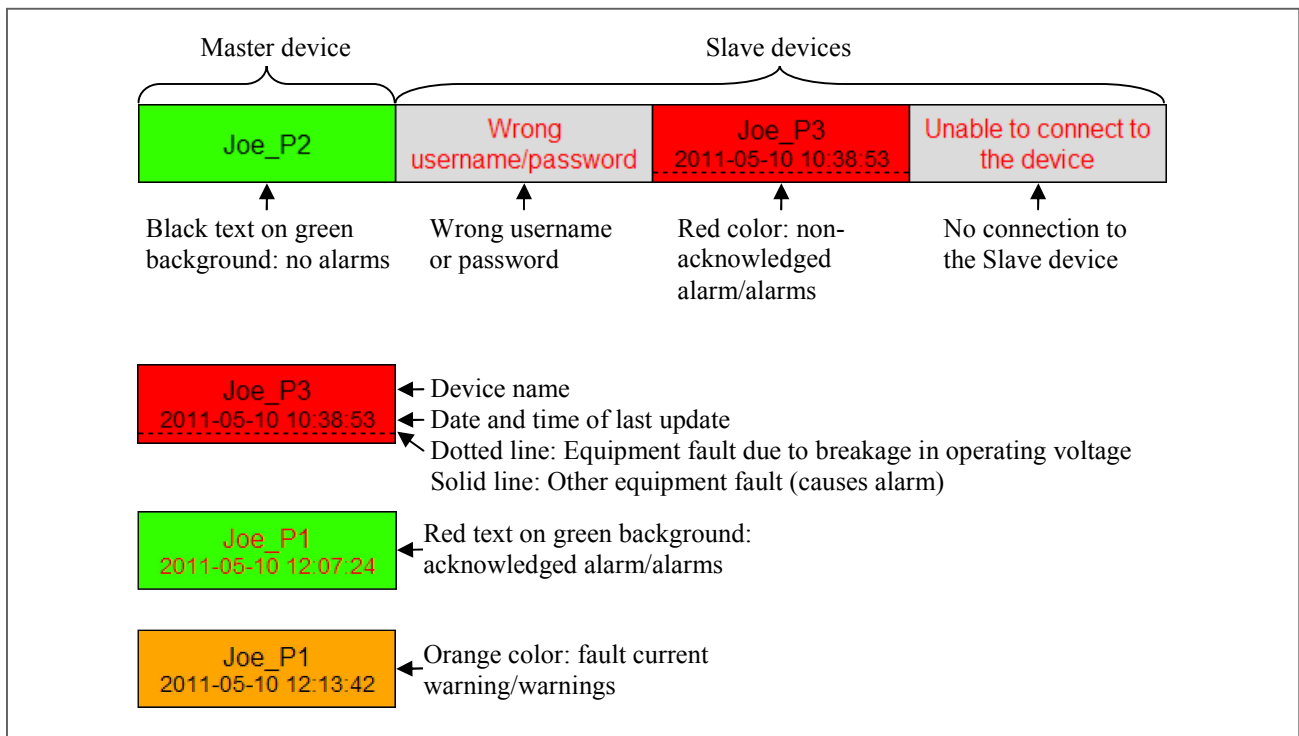


Figure 4.38. Device cells on the Master mode display

Device name and the date and time of last update are shown on the cell. The cell color tells if there are non-acknowledged alarms in the device: black text on green background means that there are no alarms. Red background means that there is at least one non-acknowledged alarm in that device. Red text on green background means that the device has at least one acknowledged alarm. Orange background means that there is at least one fault current warning in the device. Dotted line is shown under the text if there is a non-acknowledged equipment fault caused by breakage in operating voltage. There is a solid line under the text if there is some other equipment fault in the device.

Master or Slave device can be inspected by clicking the device cell. Then a new window opens to the WWW browser, and the selected devices WWW main display is loaded in the new window (see section 4.3 WWW Main Display). Device can be inspected and operations can be done in the new window just like in the regular WWW Remote Interface. If the device already has an own opened window, clicking the cell doesn't open a new window but the already open device window is activated.

Note! Browser tabs are not working properly in some browsers with Master mode. In this case tabbing must be disabled from the browser settings and use windowing. In some browsers even the windowing may not work properly. In this case please try to use some other WWW browser.

4.13.1 EDITING THE DEVICES SHOWN IN THE MASTER MODE

The device list shown in the master mode can be edited by pressing the “Devices to be shown” button on the settings panel on the left side of the screen while the device is in Master mode. Slave devices editing display opens on the screen.

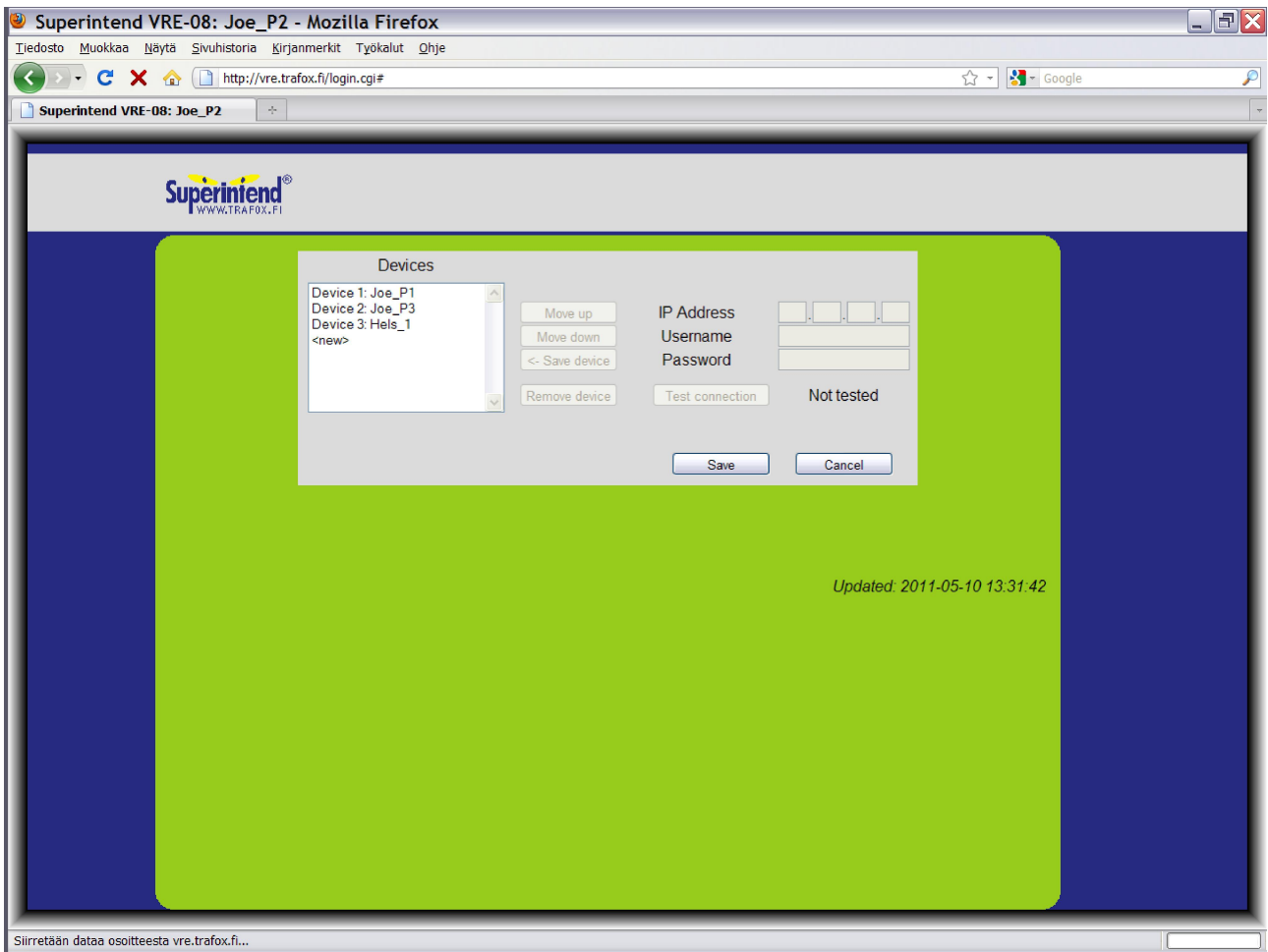


Figure 4.39. Slave devices list editing display.

All of the Slave devices are listed in the Slave devices list editing display. On the right side the settings for the selected device are shown.

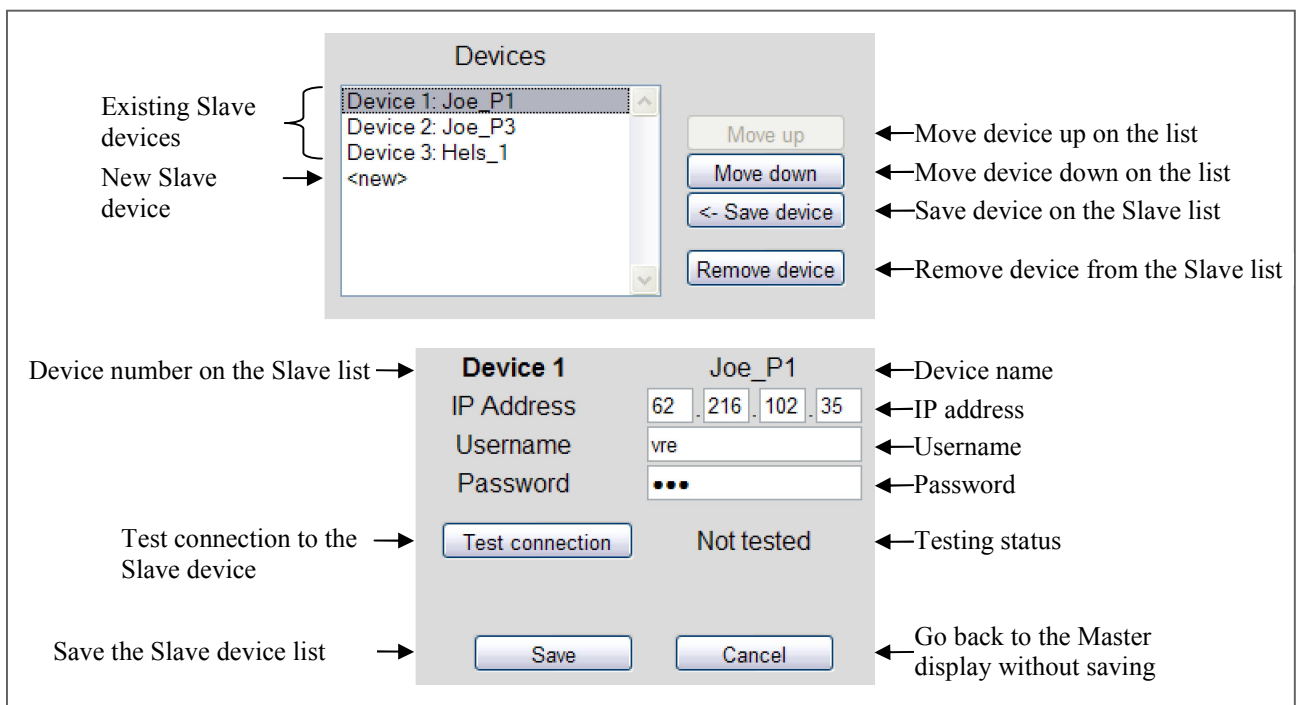


Figure 4.40. Editing fields of the Slave devices list.

Adding a new Slave device or editing an existing Slave device is done like this:

1. Choose either an existing Slave device on the list or choose <new> in case of a new Slave device
2. Input the devices IP address and username with password
3. Save the device in the Slave list by pressing the “Save” button.

After the IP address and username with password have been given it's possible to test the connection to the Slave device by pressing the “Test connection” button. Testing status is shown on the right side of the button:

Not tested	The connection has not been tested yet
Testing...	The testing is in progress
Connection OK	The connection works and username/password are correct
Wrong username/password	Connection is good, but either the username or password is wrong
Wrong IP Address	Connection failed, so the IP address is not correct

The order of the devices on the list can be changed. By pressing the “Move up” button the device moves one step up on the list. By pressing the “Move down” button the device moves one step down on the list. The device can be removed from the list by pressing the “Remove device” button.

Slave devices list can be saved by pressing the “Save” button. Administrator password is asked before the saving is done. After the correct password is given the device saves the Slave list in the Flash memory and then goes back to Master mode.

By pressing “Cancel” the list is not saved and the device goes back to Master mode.

5 ALARMS

5.1 OPERATION OF THE ALARM RELAY AND ALARM LIGHT

The alarm relay has a changeover contact which works as follows:

- Alarm: connected pins 1 and 3 of connector J4
- No alarm: connected pins 1 and 2 of connector J4

Operation of the alarm relay and alarm light:

	Normal status	Non-acknowledged alarm	Acknowledged alarm	No operating voltage
Alarm relay	No alarm	Alarm	No alarm	Alarm
Alarm light	Off	Blinking light	Off	Off

Normal status	Alarm acknowledged, failure repaired
Non-acknowledged alarm	Alarm non-acknowledged (failure repaired or not repaired)
Acknowledged alarm	Alarm acknowledged, failure not repaired
No operating voltage	No operating voltage in the VRE device

5.1.1 CURRENT ALARM

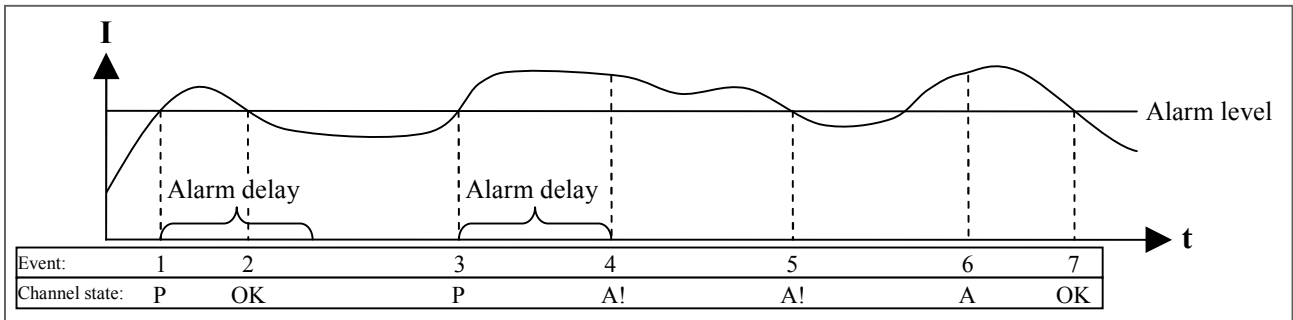


Figure 5.1. Generation and turning off of the fault current alarm

1	Fault current is above the alarm limit. Channel goes to "P" current peak state
2	Fault current decreases under alarm limit before the alarm delay has run out. Channel goes back to the normal OK state
3	Fault current is above the alarm limit. Current peak state "P" is initiated
4	Fault current has stayed above the alarm limit as long as the set delay time. Non-acknowledged fault current alarm is generated on channel. There is a blinking "A" on the device display and "A!" on the WWW remoted interface. Alarm light is blinking and the relay is in alarm state
5	Current decreases under the alarm limit. Alarm has not been acknowledged and stays on.
6	Alarm is acknowledged by either with the OK button or on the channel specific display of the WWW remote interface. Channel state changes to acknowledged alarm, so a non-blinking "A" is shown both on the device display and on the WWW remote interface. Alarm light turns off and alarm relay exits the alarm state.
7	Current decreases under the alarm limit. Acknowledged fault current alarm turns off and the channel returns to the normal OK state. New fault current alarm is again possible in accordance with rows 3 and 4 of this table.

5.1.2 SELF TESTING AND EQUIPMENT FAILURE ALARMS

Fault current monitor VRE-08/16/32/64 is monitoring its own state and the condition of the measurement chain all the time. The inspection of the measurement chain is done once in a minute for each measurement chain. When the equipment is all right, the channel state is "OK" on the channel specific display (see chapter 3.6 Channel specific display). Channel state is "OK" on the board specific display of the WWW remote interface (see chapter 4.4 Board specific WWW display). There is a "CHANNEL OK" indicator on the channel specific display of the WWW remote interface (see chapter 4.5 Channel specific WWW display).

In case a failure occurs in the self test, it's reported on the main display (see chapter 3.3 Main display) and the channel state indicator is "F" on the board specific display (see chapter 3.5 Board specific display). The reason of the equipment failure alarm is told on the channel specific display: "HI TEST CURRENT" or "LOW TEST CURRENT".

Failure occurred in the self test is reported on the main display of the WWW remote interface (see chapter 4.3 WWW main display) and on the board specific display by showing a state indicator "F". The reason of the equipment failure alarm is told on the channel specific display: "HI TEST CURRENT" or "LOW TEST CURRENT".

Generation and removing the equipment failure alarms are done like this:

- Alarm light is blinking to indicate a new non-acknowledged equipment failure alarm. The alarm relay is also in alarm state. There is a blinking "F" on the display next to the defective channel. On the WWW remote interface there is a "F!" on the screen.
- When the equipment failure alarm is acknowledged, the alarm light goes off and the alarm relay exits the alarm state. There is a non-blinking "F" next to the channel both on the screen and on the WWW remote interface to indicate an acknowledged alarm.
- "F" disappears when the self test confirms that the failure has been repaired.

If there are simultaneous equipment failures and power fault, there is an indicator on the screen indicating a power fault ("P" or "A").

5.2 OPERATION OF THE WARNING RELAY AND WARNING LIGHT

The warning relay has a changeover contact which works as follows:

- Warning: connected pins 1 and 3 of connector J3
- No warning: connected pins 1 and 2 of connector J3

Operation of the warning relay and warning light:

	Normal status	Fault current warning	No operating voltage
Warning relay	No warning	Warning	Warning
Warning light	Off	On	Off

Fault current monitor VRE-08/16/32/64 has a possibility to use a fault current warning. Warning function is used when the information about the rising of the current is wanted before the alarm level is exceeded. Warning level is given as percentage of the alarm level. For example, if the alarm level is 300 mA and warning level setting is 70%, then the warning level will be 210 mA.

When there is a warning level given to a channel (see chapter 3.7.1 Channel setup display), the channel goes to warning state when the current increases above the warning level (see the figure below). Warning state is indicated with warning relay and warning light. The device exits the warning state after the current has decreased below the warning level.

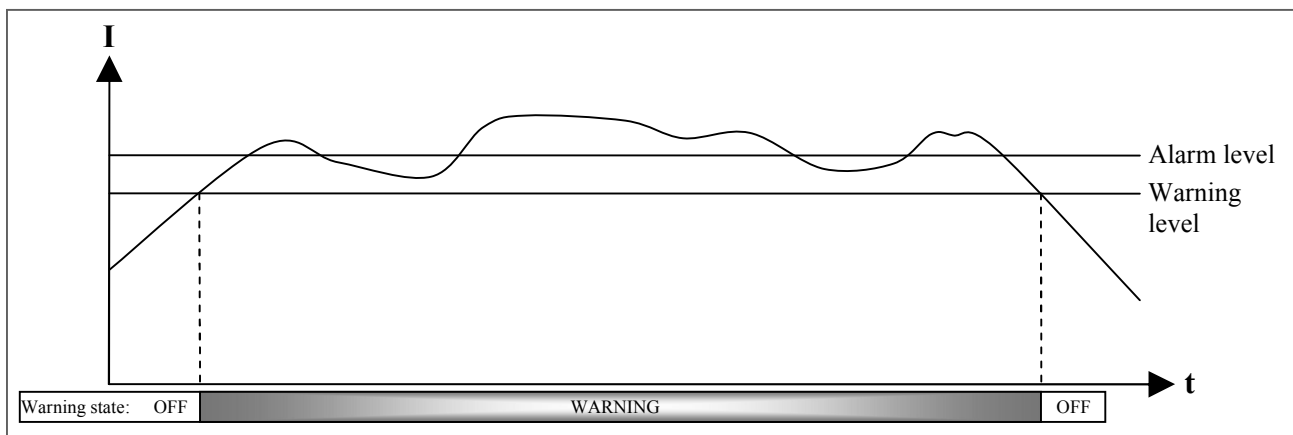


Figure 5.2. Generation and turning off of the fault current warning

5.3 EQUIPMENT FAULTS

Fault current monitor VRE-08/16/32/64 has a self test function which supervises the equipment condition continuously. The faults occurred in the self test produce an equipment fault, which is shown on the main display (see chapter 3.3 Main display) and on the WWW remote interface (see 4.3 WWW main display). Equipment faults also cause alarm to the relay and to the light in all other cases than equipment faults caused by power faults. Equipment faults are shown according to the table below:

	Normal state	Non-acknowledged equipment fault (power fault)	Non-acknowledged equipment fault (other)
"Device state" on the Main display	OK	Non-blinking "H"	Blinking "H"
"Device state" on the WWW remote interface	OK	"H"	"H!"
Alarm relay	No alarm	No alarm	Alarm
Alarm light	Off	Off	Blinking

Equipment faults which don't cause alarm:

Text on the display	Text in the WWW remote interface	Cause
POWER FAULT	POWER FAULT	Power fault in device
SOFTWARE RESET	SOFTWARE RESET	Program malfunction
WATCHDOG	WATCHDOG FAULT	Processor watchdog fault

Equipment faults which cause alarm:

Text on display	Text in the WWW remote interface	Syy
FLASH READ FAULT	FLASH READ FAULT	Fault in reading Flash memory
FLASH WRITEFAULT	FLASH WRITEFAULT	Fault in writing Flash memory
KEYBOARD FAULT	KEYBOARD FAULT	Error in reading keyboard
NOT CALIBRATED	NOT CALIBRATED	Error in calibration constants
PROG CRC ERROR	PROG CRC ERROR	Program memory error
PARAM CRC ERROR	PARAM CRC ERROR	Setup memory error
AD CONVERT FAULT	AD CONVERT FAULT	Fault in the A/D converter of the board
OFFS VOLT FAULT	OFFS VOLT FAULT	Fault in the offset voltage of the board
PRE-AMP FAULT	PRE-AMP FAULT	Fault in the measurement pre-amp
POS VOLT FAULT	POS VOLT FAULT	Fault in the positive supply voltage
NEG VOLT FAULT	NEG VOLT FAULT	Fault in the negative supply voltage
TEST CURR FAULT1	TEST CURR FAULT1	Fault 1 in the test current unit
TEST CURR FAULT2	TEST CURR FAULT2	Fault 2 in the test current unit
ZEROING FAULT	ZEROING FAULT	Fault in measurement signal zeroing
Equipment faults on the grey background are related to measurement. Number of defective measurement board is also shown.		

Ten latest equipment faults are kept in the memory and they can be reviewed on the latest equipment faults display (see chapter 3.8.3 Latest equipment faults display) and on the latest equipment faults display on the WWW Remote Interface (see chapter 4.9 Latest Equipment Faults display on the WWW Remote Interface)

5.4 ALARM ACKNOWLEDGEMENT

Alarms (fault current alarms, equipment failure alarms and equipment faults) are acknowledged by pressing the OK button. Regardless of in which display state the device is in, pressing the OK button always initiates acknowledgement mode (see chapter 3.4 Alarm acknowledgement).

Alarms can be acknowledged on the WWW remote interface, too. Pressing the OK button there initiates also the acknowledgement mode (see chapter 4.3 WWW main display). Another option for acknowledging alarms is to go from the WWW main display via the board specific display (see chapter 4.4 Board specific WWW display) to the channel specific WWW display of the alarming channel (see chapter 4.5 Channel specific WWW display). In addition to pressing the OK button, the equipment fault acknowledgement mode can also be initiated by pressing the button with character "H" in the Device state part of the screen (see chapter 4.6 Equipment fault acknowledgement in the WWW remote interface).

6 WARRANTY

The warranty starts on the day of delivery. The warranty means that the manufacturer agrees to replace or repair, without any cost, the parts which have manufacturing or material defects, which affect the usefulness of the part.

This warranty is always limited to the value of the product itself and no indirect damages will be indemnified. The warranty does not cover any direct freight costs or travelling costs caused by the warranty repair.

The warranty does not include:

- defects caused by incorrect usage or installation
- defects caused by fire, lightning, or careless usage or storage of the device.

The warranty period is one (1) year starting from the delivery day. Any variation from the conditions mentioned above shall be certified in writing.

PRESENTATION OF A WARRANTY CLAIM

In the event of covered by the warranty, please contact the dealer or manufacturer of the device. Shipping list of the manufacturer is a valid warranty certification. Repairs covered by the warranty will be done without any cost. Other necessary repairs will be done simultaneously and subject to normal charges.

Manufacturer:

Muuntosähkö Oy - TRAFIX

Niittyälänpolku 4
PL 10
00621 HELSINKI
FINLAND

tel +358 207 933 700
fax +358 207 933 746

7 TECHNICAL SUMMARY

Fault current monitor VRE-08/16/32/64

Supply voltage	95–240 V 47–63 Hz
Power consumption	14,3 W
Operating temperature	0–55 °C
Humidity	< 95 %, non-condensing
Installation site	indoor locations
Operating altitude	not more than 2000 m
Mechanical dimensions	see chapter 2.2.2 Mechanical installation
Weight	
• VRE-08	1320 g
• VRE-16	1720 g
• VRE-32	1900 g
• VRE-64	2730 g

Connections

- Supply voltage, RS-485, warning and alarm relays 1,5 mm² screw terminal plug, tightening torque 0.5-0.6 Nm
- Ethernet (10Base-T) RJ-45 -connector
- Sum current transformers 4 pole Modular connector

Measuring characteristics

Channels

- VRE-08 8 pcs
- VRE-16 16 pcs
- VRE-32 32 pcs
- VRE-64 64 pcs

Measuring range	0 A–20 A (50–60 Hz)
Resolution	1 mA (I < 1 A)
	10 mA (1 A ≤ I < 10 A)
	100 mA (I ≥ 10 A)

Accuracy of measurement with

- VMI ±5 % (closed core sum current transformer)
- VMIK ±10 % (split-core sum current transformer)
- VMIC(K) ±20 % (window type sum current transformer)

Setup

- Channel in use ON/OFF
- Alarm range 5 mA–10 A
- Alarm delay 0–95 s
- Warning level OFF/1–100 % of alarm level (not in use by default)
- Channel testing in use ON/OFF

Alarm relay

Contact action	one changeover contact
Current rating	max. 8 A
Switching current	max. 8 A 250 VAC / 30 VDC, resistive load
Breaking capacity	max. 240 W / 2000 VA

Warning relay

Contact action	one changeover contact
Current rating	max. 8 A
Switching current	max. 8 A 250 VAC / 30 VDC, resistive load
Breaking capacity	max. 240 W / 2000 VA

Sum current transformers

Thermic limiting current $I_{th/t}$	20kA/s
Dynamic limiting current I_{dyn}	50kA
Contin. thermic limiting current	100A

Mechanical dimensions see chapter 8 Sum current transformer dimensions

Weight

• VMI-25	0,15 kg
• VMI-35	0,30 kg
• VMI-60	0,54 kg
• VMI-95	0,80 kg
• VMI-130	1,25 kg
• VMI-200	1,50 kg
• VMIK-25	0,21 kg
• VMIK-35	0,36 kg
• VMIK-60	0,60 kg
• VMIK-95	0,98 kg
• VMIK-130	1,45 kg
• VMIK-200	1,70 kg

8 SUM CURRENT TRANSFORMER DIMENSIONS

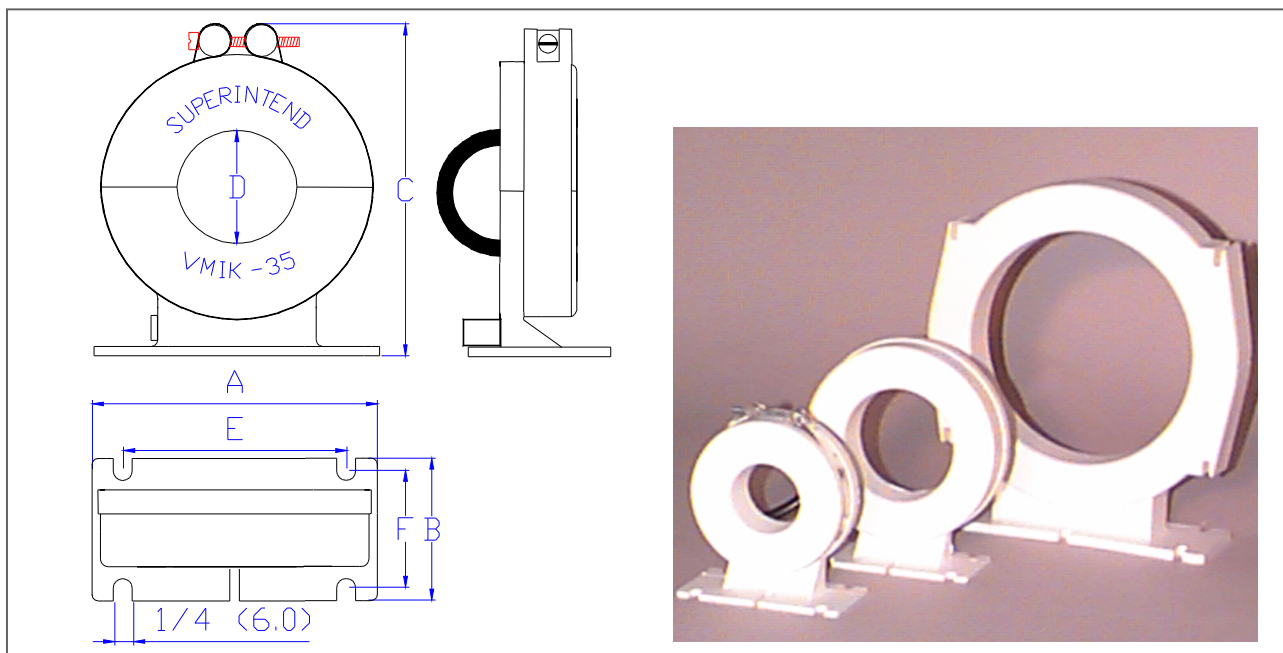


Figure 8.1. Dimensional drawing of a sum current transformer

VMI-xx: closed model

Model	D mm	A mm	B mm	C mm	E mm	F mm	Weight kg
VMI-25	25	46	26	53	35	-	0.15
VMI-35	38	90	46	96	70	38	0.30
VMI-60	62	90	46	125	70	38	0.54
VMI-95	97	146	50	161	102	38	0.80
VMI-130	133	196	54	200	138	42	1.25
VMI-200	200	266	68	255	200	50	1.50

VMIK-xx: split-core model

Model	D mm	A mm	B mm	C mm	E mm	F mm	Weight kg
VMIK-25	23	46	26	67	35	-	0.21
VMIK-35	35	90	46	110	70	38	0.36
VMIK-60	60	90	46	140	70	38	0.60
VMIK-95	95	146	50	161	102	38	0.98
VMIK-130	130	196	54	198	138	42	1.45
VMIK-200	198	266	68	255	200	50	1.70

Window type sum current transformers

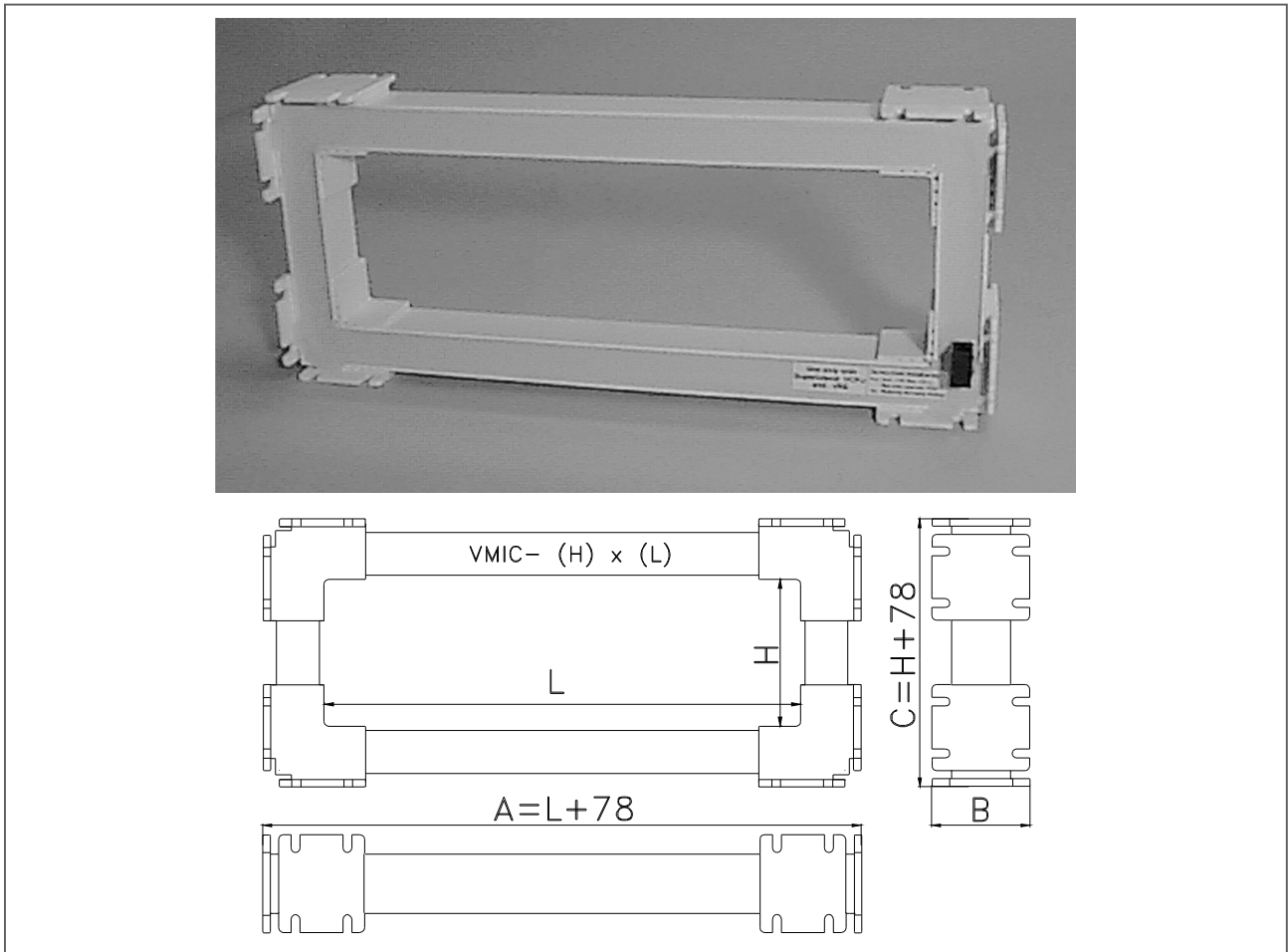


Figure 8.2. Dimensional drawing of a bus bar current transformer

Maximum and minimum measures of custom made bus bar transformers (window type):

min H	50mm
max H	204mm
min L	50mm
max L	660mm

Standard sizes

Model	H mm	L mm
VMIC(K) 105 x 204	105	204
VMIC(K) 105 x 356	105	356
VMIC(K) 105 x 400	105	400
VMIC(K) 154 x 204	154	204
VMIC(K) 154 x 356	154	356
VMIC(K) 154 x 400	154	400
VMIC(K) 154 x 508	154	508
VMIC(K) 204 x 204	204	204
VMIC(K) 204 x 356	204	356
VMIC(K) 204 x 508	204	508
VMIC(K) 204 x 610	204	610

VMIC: closed model

VMICK: split model

9 MEASUREMENT POINT SETUP TABLE

Date/author:	
VRE-08/16/32/64 name:	
Serial num:	
Location:	

Chan nel	Description of the measurement point	Channel name (12 characters)	Alarm level 5mA– 10A	Alarm delay 0–95s	Warni ng level OFF/ 1– 100%	Cha nnel testi ng ON/ OFF	Sum current transformer VMI(K)- 25/35/60/95/ 130/200
1.1							
1.2							
1.3							
1.4							
1.5							
1.6							
1.7							
1.8							
2.1							
2.2							
2.3							
2.4							
2.5							
2.6							
2.7							
2.8							

Chan nel	Description of the measurement point	Channel name (12 characters)	Alarm level 5mA– 10A	Alarm delay 0–95s	Warni ng level OFF/ 1– 100%	Cha nnel testi ng ON/ OFF	Sum current transformer VMI(K)- 25/35/60/95/ 130/200
3.1							
3.2							
3.3							
3.4							
3.5							
3.6							
3.7							
3.8							
4.1							
4.2							
4.3							
4.4							
4.5							
4.6							
4.7							
4.8							

Channel	Description of the measurement point	Channel name (12 characters)	Alarm level 5mA–10A	Alarm delay 0–95s	Warning level OFF/1–100%	Channel testing ON/OFF	Sum current transformer VMI(K)-25/35/60/95/130/200
5.1							
5.2							
5.3							
5.4							
5.5							
5.6							
5.7							
5.8							
6.1							
6.2							
6.3							
6.4							
6.5							
6.6							
6.7							
6.8							

Channel	Description of the measurement point	Channel name (12 characters)	Alarm level 5mA–10A	Alarm delay 0–95s	Warning level OFF/1–100%	Channel testing ON/OFF	Sum current transformer VMI(K)-25/35/60/95/130/200
7.1							
7.2							
7.3							
7.4							
7.5							
7.6							
7.7							
7.8							
8.1							
8.2							
8.3							
8.4							
8.5							
8.6							
8.7							
8.8							