Brüel & Kjær Vibro
A member of the NSK Group

Instruction

VIBRO Condition Monitoring 3
VCM-3

On-site Commissioning

Keep it accessible for future reference

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Instruction **VCM-3 On-Site Commissioning**, C107759.002 / V03, en, date of issue: 29.03.2022

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1 Introduction

1.1 Scope

The purpose of the On-site commissioning procedure is to bring the VCM-3 in an operational state.

- To check that the VCM-3 boots up correctly.
- To verify that all channels which shall be used for monitoring the machine, are wired correctly and responds correctly to a tap test.
- To finalize the commissioning procedures, configure the network and define the machine name.

Before starting these procedures, it is assumed that the physical system installation has been checked. *See C107758.002 EN Hardware Installation Instruction*.

The test described in the following sections is based on the factory test template which is initially loaded as part of the VCM-3 firmware. The factory monitoring (test) template is running by default in the VCM-3 when it is started up for the on-site commissioning procedure. When the on-site commissioning procedure has been completed the monitoring template, which will provide the VCM-3 with the correct personality for the particular machine type can be uploaded to the VCM-3 Homepage and activated on the device.

NOTE!

The procedures described in this instruction assume that the VCM-3 has not been commissioned before (factory settings apply).

Overview of factory monitoring (test) template	
Channel	1-10 Configured for CCS accelerometers (**C**onstant **C**urrent **S**ource) 11-12 Configured for MEMS based Tower sensors 13-16 Configured for Speed sensors 17-24 Configured for 4-20mA sensors
Descriptor list	For each AC/DC channel: • Offset voltage • 50Hz level • 60Hz level For each Speed/DC channel • Voltage reading • 50Hz level • 60Hz level For each 4-20mA channel • Current reading

NOTE!

If other sensor configurations are required for an installation test, please contact Brüel & Kjær Vibro Technical support support@bkvibro.com.

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1.2 Firmware version

Different firmware versions behave differently and looks (slightly) different. This version of the document describes the look and feel of firmware version 1.22. Older versions as used in the drawings will in general look the same but can have vital differences in what a LED color means. Always use a manual that match the Firmware version you have.

1.3 Document Conventions

Feature	Comments
Menu items, buttons, tabs, UI features, keyboard instruction	Indicated by **bold** type face. Examples: Click **Remove**. Press **Ctrl+Shift** or Press **F12**.
Path denotations	Example: File > Template > Load template
Important Note!	**Important Note** indicates information which is potentially serious to either personnel or to the unit.
Note!	**Note** text is for special attention. The information is very important for the correct operation of the system.
Tables with grey header	The content of these tables is only for information.

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2 On-site Commissioning of VCM-3

2.1 Prerequisites

To complete the on-site commissioning procedure, the following must be available:

A service laptop with:

1. A Microsoft Edge browser or Mozilla Firefox browser. Due to the installed security certificates on the VCM-3 the Google Chrome browser has difficulties in showing the VCM-3 Homepage. When you address the VCM-3 Homepage in either Microsoft Edge or Firefox some security alerts are shown. These shall be ignored.
2. The latest VCM-3 firmware version. This is optional. Only to be used if you wish to install new FW version on-site.

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3 Initial Power Up test – Visual check

Purpose:

1. To check that the VCM-3 can boot up correctly
2. To check that sensors are wired correctly
3. To check that the speed sensor is working.

NOTE!

This visible check assumes that the VCM-3 is running the factory monitoring template.

Power Up	
1	Apply power to the VCM-3
2	Wait until the boot procedure is complete. When the **Boot Status** LED turns into green the boot procedure is complete.

All channels in the VCM-3 have been configured in the factory monitoring template. Therefore, you will see a blue color LED on the AC/DC channels with no sensor connection.

After power up the VCM-3 front panel shall look like the picture below.

If the LED's deviates from the description in the table below there is a problem with the VCM-3 or the installation of the sensors. This shall be investigated before the commissioning procedure is continued.

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Initial LED status from factory		
Inputs/Outputs/System and associated LED color		**Explanation**
❶	Network	Off – as the VCM-3 is not connected to any network (beside RJ-45 connector)
❷	Status: System	On – Blue, indicates that the VCM-3 is not connected to a server in the condition monitoring centre.
❸	Status: Template	The factory template is loaded and running.
❹	Status: Online	No gateway IP address is defined, the VCM-3 is not connected to the network
❺	Boot Status	On-Green. This indicates the the VCM-3 has completed it's boot procedure correctly
❻	DI/O	On – Green because Modbus is enabled in the factory template.
	DO	Off – as the digital output is not in use
	DI	Off – as the digital input is not in use
❼	AC/DC	On – Green, input channels which are wired to an accelerometer. In this example channel 1 to 9.
	AC/DC	On – Blue, input channels which are configured as constant current source (CCS) accelerometers, but not wired to an accelerometer.
	AC/DC (11 and 12)	On – Blue, input channels which are configured for an AS-247 MEMS sensor with 24 V supply, but not wired to a sensor.
❽	Speed/DC Speed/DC	On – Green. Speed inputs shows green light as all Speed/DC sensor inputs are enabled in the factory template. If an input is connected to a speed sensor the LED will flash between dark green and light green If the machine is rotating slowly or you put a piece of metal in front of the mounted speed sensor.
❾	4-20mA	On – Green, as all 4-20mA sensor inputs are enabled in the factory template

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3.1 Investigation of deviations in LED colors after initial power up

It is recommended to remedy any visible problems, if possible, before you proceed with the remaining part of the commissioning procedure.

3.1.1 Sensor problems on connected sensors (signal inputs)

Color	Explanation
Off	Channel disabled
Green	Channel enabled, no errors
Red	Template error
Blue	Channel voltage out of defined range Tacho out of range (for tacho channels)
Yellow (blinking)	Level 3 indication is controlled by the template (the blinking is combined with red, green, or blue)

If there is an error indication on the channel LED it is important to know what type of sensor you are working with. There are two types of sensors:

3.1.2 CCS (constant current supply) sensors

Color	Explanation
Blue	Sensor is connected correctly but it is outputting outside of the allowed range. Check the sensor's calibration. Check the allowed range in the template and the bias level in the tap test.
Blue	Sensor is not connected. Sensor is not connected correctly (S+ and S-/C interchanged). Sensor is not grounded (S+ and S- are connected, but S- are not connected to C).

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3.1.3 Non-CCS sensors

Color	Explanation
Blue	Sensor is not connected. Sensor is not connected correctly (S+ and S- interchanged). Check the sensor's calibration. Check the allowed range in the template and the bias level in the tap test.
Blue	For non-CCS sensors this is indicating a serious problem with the sensor. If it is a tacho sensor that is outputting >25V you can safely ignore this error, but in all other cases you should check the sensor.

3.1.4 VCM-3 hardware (device) problems

System LED

Color	Explanation
Green	Connected to backend
Yellow	Disconnected from backend (was previously connected)
Blue	Disconnected from backend
Red	Watchdog error/reboot imminent
White	Firmware is upgrading
Purple	System is sampling real-time
Cyan	System has stopped real-time sampling

Template LED

Color	Explanation
Green	Template loaded
Yellow	Template not loaded
Blue	Template error
Red	Fatal error (both template and fallback template failed)

Online LED

Color	Explanation
Green	Gateway pingable
Yellow	Factory settings
Blue	Gateway not pingable
Red	Configuration error / gateway not reachable (reachable before)
Dark blue	Reseting to default IP address

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Device Status / LED color	Explanation
Status: System	On – Red. Watchdog about to reboot the VCM-3 **Action:** 1. If watchdog reboot does not help, make a manual reboot. The reboot activates some repair facilities. 2. If 1) does not help, then make an upgrade of the firmware. Refer to the procedure in Appendix 2. 3. If 2) does not help the VCM-3 or the running template has a fault. Try changing to the factory template. If that solves the problem the template must be replaced or updated. If the problem is present with the factory template – replace the unit..
Status: Template	On – Red. Fatal template error **Action:** 1. Reboot the VCM-3 and check if the problem disappears. The reboot activates some repair facilities. 2. If 1) does not help then make an upgrade of the firmware. Refer to the procedure in Appendix 2. 3. If 2) does not help the VCM-3 has a fault. You cannot complete the commissioning procedure. Exchange the VCM-3 with a spare unit.
Status: Online	On – Red. Either default gateway cannot be reached (but before) or network has a configuration error. (Maybe the specified IP address is illegal) **Action:** 1. Reboot the VCM-3 and check if the problem disappears. The reboot activates some repair facilities. 2. If 1) does not help go to the Network configuration page and check.
Boot Status	On – Red. Unit is off and power is within specification. Ready to be turned on. **Action:** 1. Push the **Power Up/Down** button but only with a short push. If this turns the **Boot Status** into green the VCM-3 is OK. 2. If 1) does not help then reboot the VCM-3 and check if the problem disappears. The reboot activates some repair facilities. 3. If 2) does not help the VCM-3 has a fault. You cannot complete the commissioning procedure. Exchange the VCM-3 with a spare unit.

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4 VCM-3 Homepage Commissioning Procedure

After the visible inspection check the on-site commissioning procedure shall be continued using the functionality of the VCM-3 Homepage.

Via the Homepage the following steps shall be completed:

1. Check the VCM-3 firmware version
2. Check the Operational Status
3. Check the sensor bias voltages
4. Perform a Tap test of all accelerometers in order to check the correct mounting of the accelerometers
5. Check the rotational speed sensor signal using a piece of metal
6. Configure the VCM-3 with the correct IP addresses and enable services
7. Save the commissioning report
8. Reboot the VCM-3 after completion
9. Inspect the VCM-3 front plate after reboot

4.1 Log into the VCM-3 Homepage

How to connect a laptop and perform the login.	
1	Change the laptop network settings to match the ip range of the VCM-3. Factory default network settings of VCM-3 are as follows: • Netmask (subnet mask): 255.255.255.0 • VCM-3 Ipv4 address: 192.168.2.202 **NOTE!** Brüel & Kjær Vibro recommends that to set the laptop to Ipv4 address 192.168.2.199, Netmask 255.255.255.0
2	Connect the laptop to one of the RJ45 ports of the VCM-3 unit using a LAN cable. RJ45 cable connector.
3	Write the VCM-3 IP address in the browser. Ignore the security notifications and proceed to the VCM-3 login page.

Table continued on next page…

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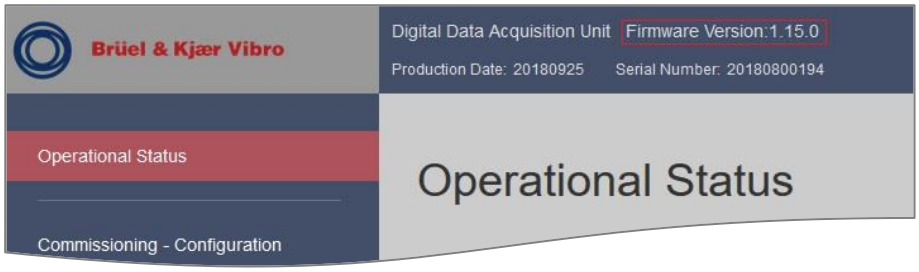
4	 Use the following credentials: **Username: vcm_service** **Password: VCM3-Service**

4.2 Check the VCM-3 firmware version and update firmware

Check firmware version	
1	 After the login procedure is completed chack the firmware version number is located in the page header.
2	If the firmware is version 1.14 or lower, the VCM-3 must be updated to a later version. Refer to the procedure in Appendix 2. Initial (first) release firmware version is 1.15.

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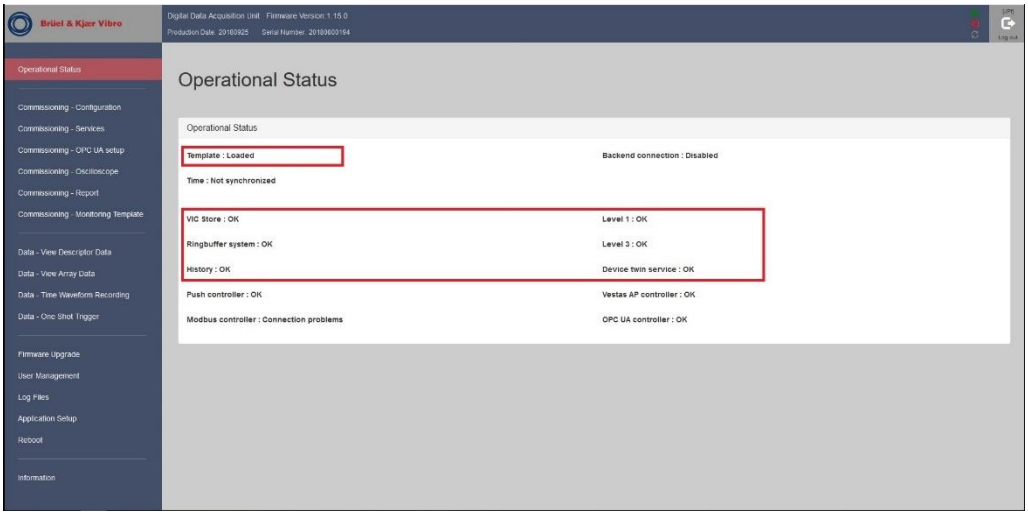
4.3 Check the Operational Status

NOTE!

This page is only available on VCM-3 with installed firmware version 1.15 or higher.

How to inspect the Operational Status page	
1	 After login the Operational Status page is shown. This page gives an overview of the present status of the VCM-3. As a general rule the status indicators in the red boxes must have the status as shown on the screen shot. Otherwise there is a problem with the VCM-3. The other status indicators are dependent upon the state of the commissioning procedure.
2	If the status indicators in the red boxes shows a different result, try to reboot the VCM-3 and inspect the Operational Status page again. 1. Reboot the VCM-3 and check if the problem disappears. The reboot activates some repair facilities. 2. If 1.) does not help then make an upgrade of the firmware. Refer to the procedure in On-site Commissioning instruction C107759.002 EN: Appendix 2. 3. If 2.) does not help the VCM-3 has a fault. Exchange the VCM-3 with a spare unit.

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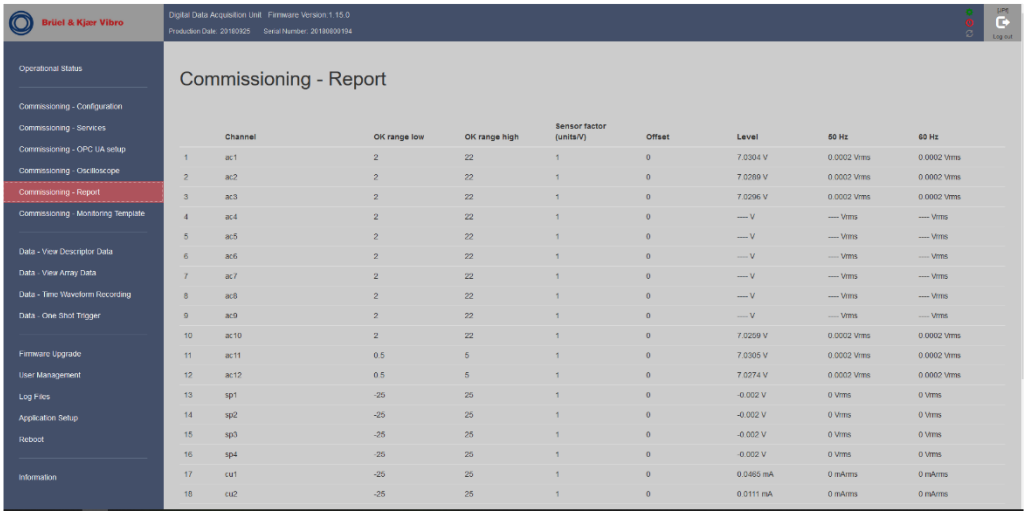
4.4 Check bias voltages of sensors

Use the Commissioning Report feature to check the bias voltages of the connected sensors.

NOTE!

The Commissioning Report is only supported with an activated Factory Monitoring Template, which is not to be exchanged with the Standard (Master) Monitoring Template and/or the customized Monitoring Template created with the VCM-3 Editor software.

View Commissioning Report	
1	Select Commissioning Report from the VCM-3 Homepage menu
2	 Inspect the report. • The bias voltages (Level) of CCS sensor shall be between 11 and 14 Volts • The bias voltages (Level) of the AS-247 MEMS sensor on Channel 11 and 12 (if present) shall be between 1.5 and 3 Volt. • Put a piece of metal in front of the rotational speed sensor. It shall show approximately 25 V. The 50/60Hz noise shall be in the mV range

	Channel	OK range low	OK range high	Sensor factor (units/V)	Offset	Level	50 Hz	60 Hz
1	ac1	2	22	1	0	7.0304 V	0.0002 Vrms	0.0002 Vrms
2	ac2	2	22	1	0	7.0269 V	0.0002 Vrms	0.0002 Vrms
3	ac3	2	22	1	0	7.0296 V	0.0002 Vrms	0.0002 Vrms
4	ac4	2	22	1	0	---- V	---- Vrms	---- Vrms
5	ac5	2	22	1	0	---- V	---- Vrms	---- Vrms
6	ac6	2	22	1	0	---- V	---- Vrms	---- Vrms
7	ac7	2	22	1	0	---- V	---- Vrms	---- Vrms
8	ac8	2	22	1	0	---- V	---- Vrms	---- Vrms
9	ac9	2	22	1	0	---- V	---- Vrms	---- Vrms
10	ac10	2	22	1	0	7.0259 V	0.0002 Vrms	0.0002 Vrms
11	ac11	0.5	5	1	0	7.0305 V	0.0002 Vrms	0.0002 Vrms
12	ac12	0.5	5	1	0	7.0274 V	0.0002 Vrms	0.0002 Vrms
13	sp1	-25	25	1	0	-0.002 V	0 Vrms	0 Vrms
14	sp2	-25	25	1	0	-0.002 V	0 Vrms	0 Vrms
15	sp3	-25	25	1	0	-0.002 V	0 Vrms	0 Vrms
16	sp4	-25	25	1	0	-0.002 V	0 Vrms	0 Vrms
17	cu1	-25	25	1	0	0.0465 mA	0 mArms	0 mArms
18	cu2	-25	25	1	0	0.0111 mA	0 mArms	0 mArms

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4.5 Make tap test of the accelerometers

With the tab test can check the signal from each of the connected accelerometers and the speed sensor by using the Oscilloscope function of the VCM-3 Homepage. In addition, it can be checked whether the sensors are connected correctly to the VCM-3 input channels.

NOTE!

The intended use of the Oscilloscope function is during commissioning to check the input channel signal (raw sensor signal).
The Oscilloscope function should only be used with the factory monitoring template for commissioning.
By using this function with other templates than the commissioning (factory monitoring) template the Oscilloscope plot can freeze or the VCM-3 Homepage becomes unresponsive.
When this condition occurs, the user usually has to call up another function on the VCM-3 homepage and then return to the Oscilloscope view.

IMPORTANT NOTE!

The measurement functionality of the VCM-3 is not affected by this behavior! All measurement functions of the VCM-3 hardware/firmware continue to run, alarm states are registered and communication via MODBUS or OPC is maintained.

Select the Oscilloscope window on the VCM-3 Homepage	
1	The oscilloscope shows the time waveform from all sensor signals. When tapping each of the accelerometers you can check whether the respons from the accelerometer appears on the expected channel. The update rate of the display can be adjusted so it is possible to tap a group of sensors in a certain sequenceand then check the result afterwards.

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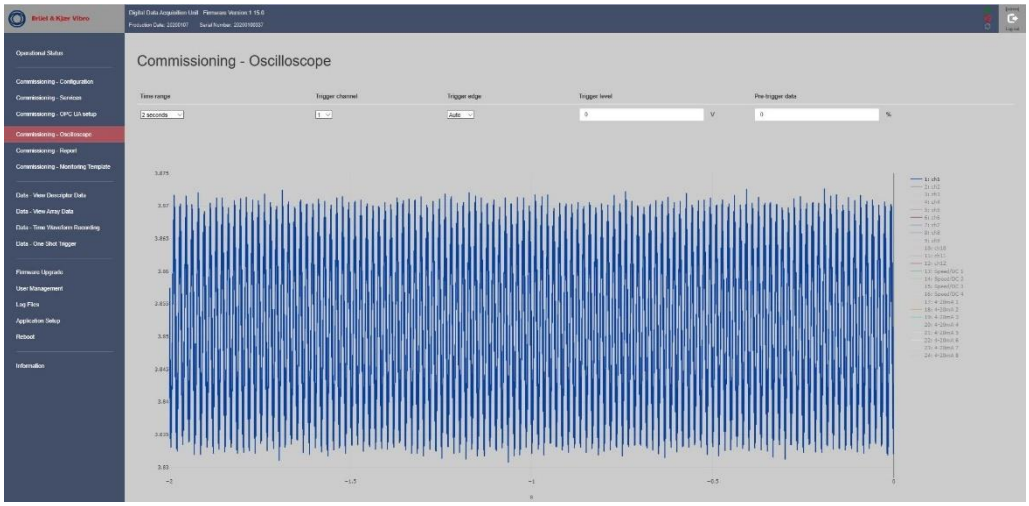
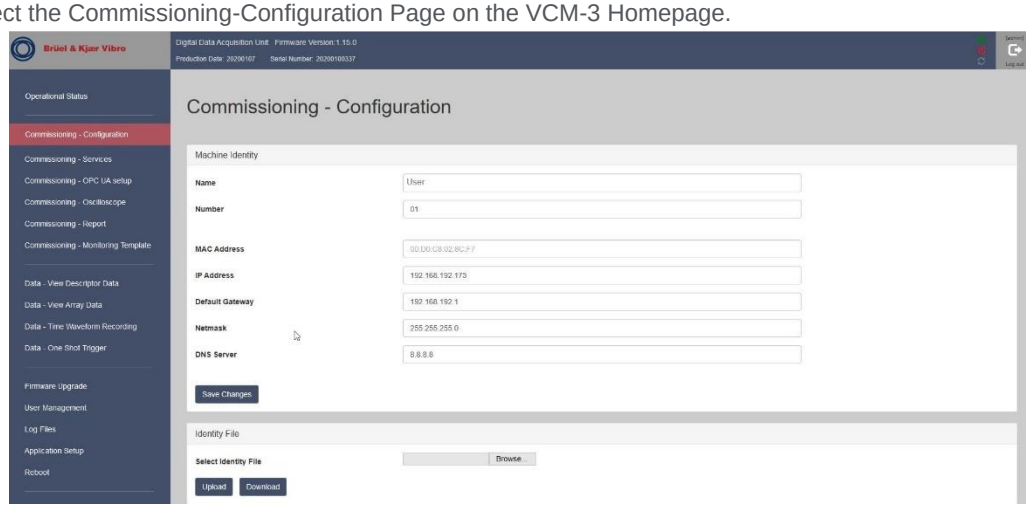
2	Use the Oscilloscope function to check the sensor connections and that the sensor provides a valid signal. 

4.6 Configuration

IMPORTANT NOTE!

It is essential that this manual process is done correct, otherwise you may require an extra visit to rectify the information.

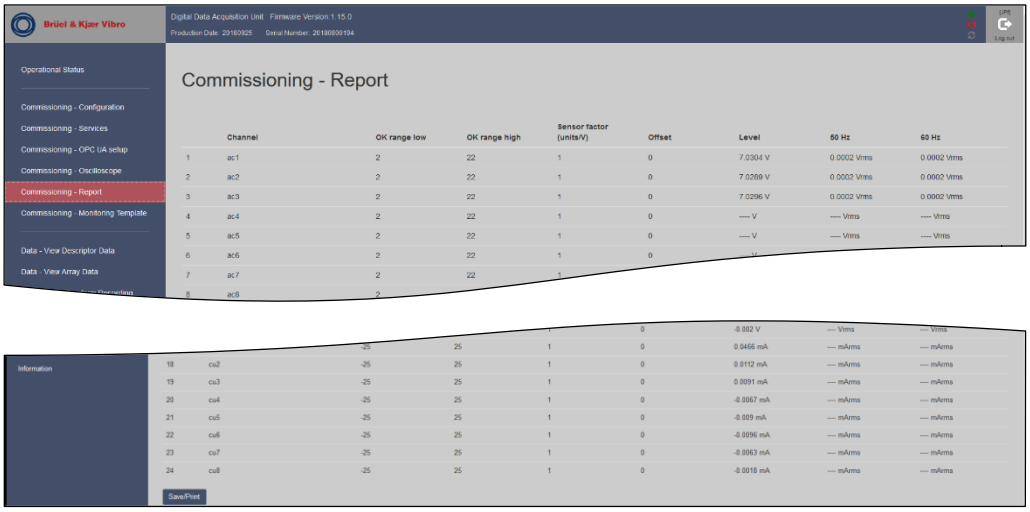
Configure network and machine specification
Select the Commissioning-Configuration Page on the VCM-3 Homepage. 
On the **Commissioning – Configuration** page – key in the network configuration • Name: Enter a machine name • Number: Enter a number of the machine • IP Address • Default Gateway • Netmask
Remember to click **Save Changes**

4.7 Document the completed commissioning process

Use the Commissioning Report feature to document the final commissioning result.

IMPORTANT NOTE!

Send the commissioning reports to the back office (B&K Vibro Hotline) staff.
It is valuable information in case of problems with connections to the VCM-3.

View Commissioning Report	
1	Select Commissioning Report from the VCM-3 Homepage menu
2	
Download the Commissioning Report to the service PC	
1	Save the report by clicking **Save/Print** at the bottom of the Commissioning Report page. A print window is automatically opened. Select the save to PDF feature in the print window. Save the report with a turbine name or number and the IP address. Then it is so it easy to recognize again.
2	The saved Commissioning report contains: • Machine Name • Machine Number • Firmware Version • Serial Number of VCM-3 • IP Address • MAC Address • Default Gateway • Netmask • DNS Server • Enabled services • Active monitoring template • Identification of the user • Bias voltages and 50/60Hz noise.

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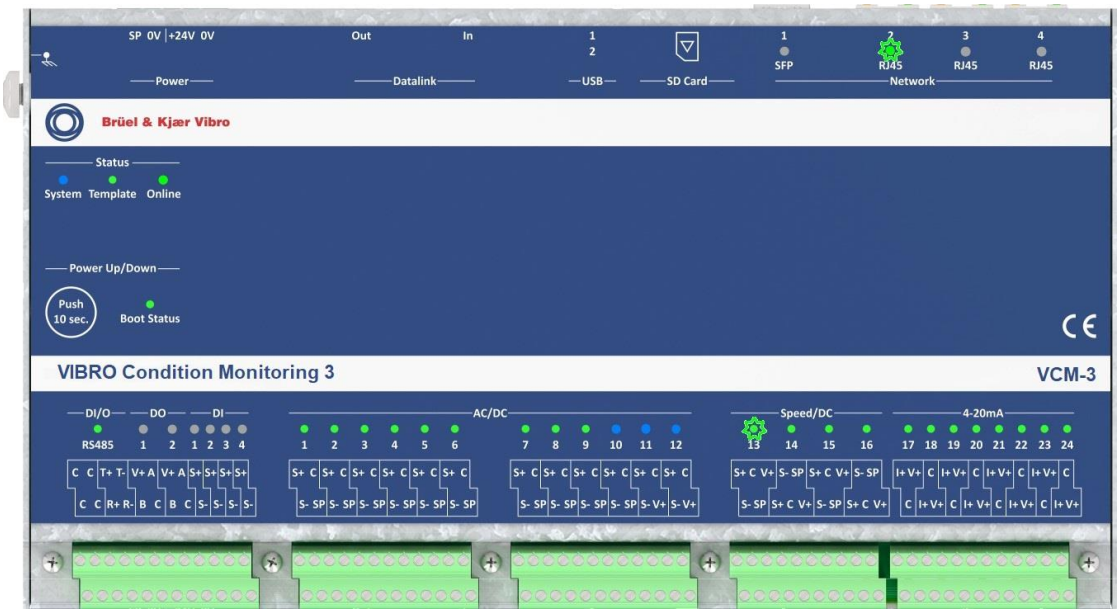
4.8 Completing on-site commissioning – visible check

IMPORTANT NOTE!

This visible check assumes that the VCM-3 is running the factory monitoring template.

When commissioning has completed the VCM-3 front panel shall look like the picture below.



LED color	Explanation
Network Flashing	On – flashing green. The LED on the connector where a LAN cable is connected flashes green. The VCM-3 is connected to the network.
Status – System	On – Blue, indicates that the VCM-3 is **not** connected to a server in the condition monitoring centre. On- Green, indicates that the VCM-3 is connected to a server in the condition monitoring centre. Both states are valid depending upon the actual network state.
Status - System	
Status - Template	The factory template is loaded and running.
Status - Online	A green color shows that the VCM-3 can ping the specified gateway. This tells that the VCM-3 is integrated into the network setup.
Boot Status	On-Green. This indicates the the VCM-3 has completed it's boot procedure
DI/O	On – Green, as Modbus is enabled in the factory template.
DO	Off – as the digital output is not in use.
DI	Off – as the digital input is not in use.
AC/DC	On – Green, input channels which are wired to an accelerometer. In this example channel 1-9. On – Blue, input channels which are configured as constant current source (CCS) accelerometers, but not wired to an accelerometer.
AC/DC	
AC/DC	On – Blue, input channels which are configured for an AS247 MEMS sensor with 24V supply, but not wired to a sensor.
Speed/DC Speed/DC	On – Green, as all Speed/DC sensor inputs are enabled in the factory template If the machine is rotating slowly or you put a piece of metal in front of the mounted speed sensor, the corresponding LED will flash between light green and dark green.
4-20mA	On – Green, as all 4-20mA sensor inputs are enabled in the factory template.

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5 Appendix 1: Update VCM-3 firmware

Contact Brüel & Kjær Vibro Technical support support@bkvibro.com to get information and support in case a device upgraded/updated is necessary.

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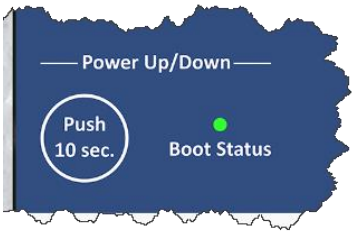
6 Appendix 2: Power Up/Down and Reboot

When the 24V power supply is connected, the VCM-3 will automatically boot up, the boot process is complete when the Boot status LED shows constant green light. If the VCM-3 shall be powered down or powered up, the normal procedure listed below is to use the Power Up/Down button named Push 10 sec.



Power Up procedure		
Action	Boot Status LED	Explanation
Connection of power to the unit		Supply voltage is out of spec. Input voltage is in the 4,5 to 18V range.
		Power is connected and within specifications.
Press the power switch		Keep the switch pressed for 6-9 seconds. Release the switch when the LED start flashing green.
		During boot the LED will be flashing green.
		Once the LED turns to solid green the unit starts running.

Power Down procedure		
Action	Boot Status LED	Explanation
Power Down (Normal) Press the power switch for 3 seconds.		Soft Power down will close down the VCM-3 in an orderly manner where it is ensured that all data is stored in non-volatile memory before power is taken off. Push the button for approximately 3 sec. until the Boot Status LED starts flashing orange/green. Release the button. The power down is now in progress.
		When the button turns into constant orange light, all data has been saved and the power plug can be removed/power can be turned off. To boot up from this state follow the Power Up procedure described below.
Hard Power Down (On error conditions)		Hard Power Down corresponds to pulling the power plug. This can be applied in case the VCM-3 ends in a state where the watchdog has stopped the VCM-3 operation due to an error in one of its services. (System LED lights red) Keep pushing the button for approximately 10 sec. until the Boot Status LED starts flashing Red/White. Release the button.
		The Boot Status now turns into constant orange light. To boot up from this state follow the Power Up procedure described below.

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