



Product Specification

Commissioning Report - Type 6827

The Commissioning Report is the outcome of the commissioning procedure carried out by Brüel & Kjær Vibro to ensure that the instrumentation mounted in the remote machinery is fully integrated into the remote monitoring system. The Commissioning Report marks the start-up of the condition monitoring of the remote machinery.

Introduction

The overall goal of the installation completion and commissioning is to check the quality of installation, construction and correct operation of all functions in order to verify that the installed monitoring system is able to fulfill its purpose.

The commissioning procedure at Brüel & Kjær Vibro is carried out according to Process Instructions certified by Germanischer Lloyd.

The commissioning procedure checks the data acquisition unit which is installed in the remote wind turbine as well as the capability of the monitoring system at Brüel & Kjær Vibro to store and display the recorded measurements from the machinery under commissioning.

The commissioning ends up with a report indicating that the system is online and all types of measurements are enabled and recorded in the COMPASS database.

This Product Specification contains several terms and abbreviations of which you may not be familiar. To assist your reading, the last section of this Product Specification provides a glossary list.

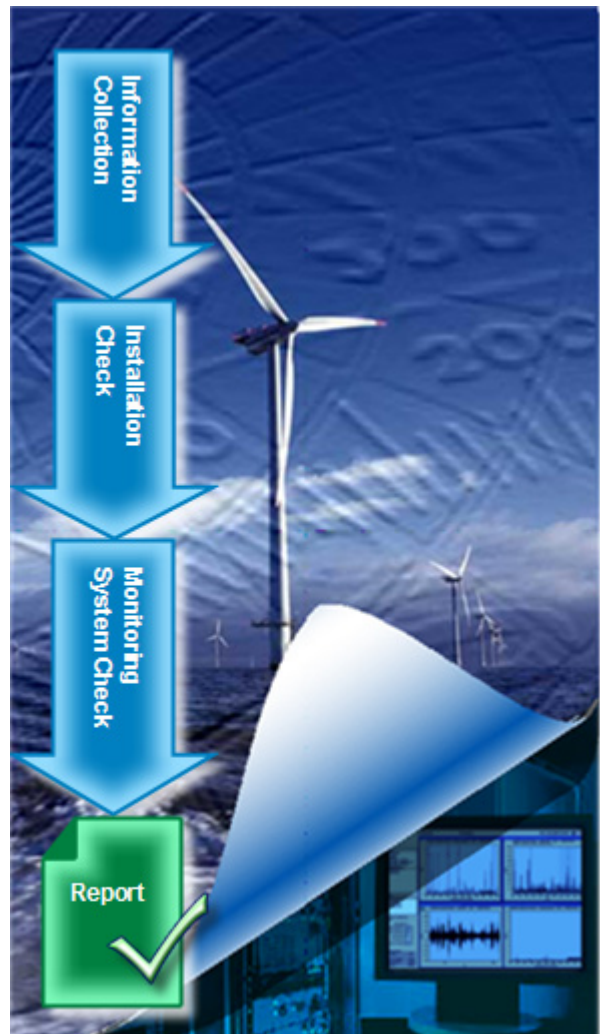
Commissioning – In General

The commissioning process is split into three main parts:

- **Information Collection** - where information is acquired. E.g. Country, Park name, Turbine type, Gearbox Type etc..
- **Installation check** – where the operation of the data acquisition unit and data communication is verified.

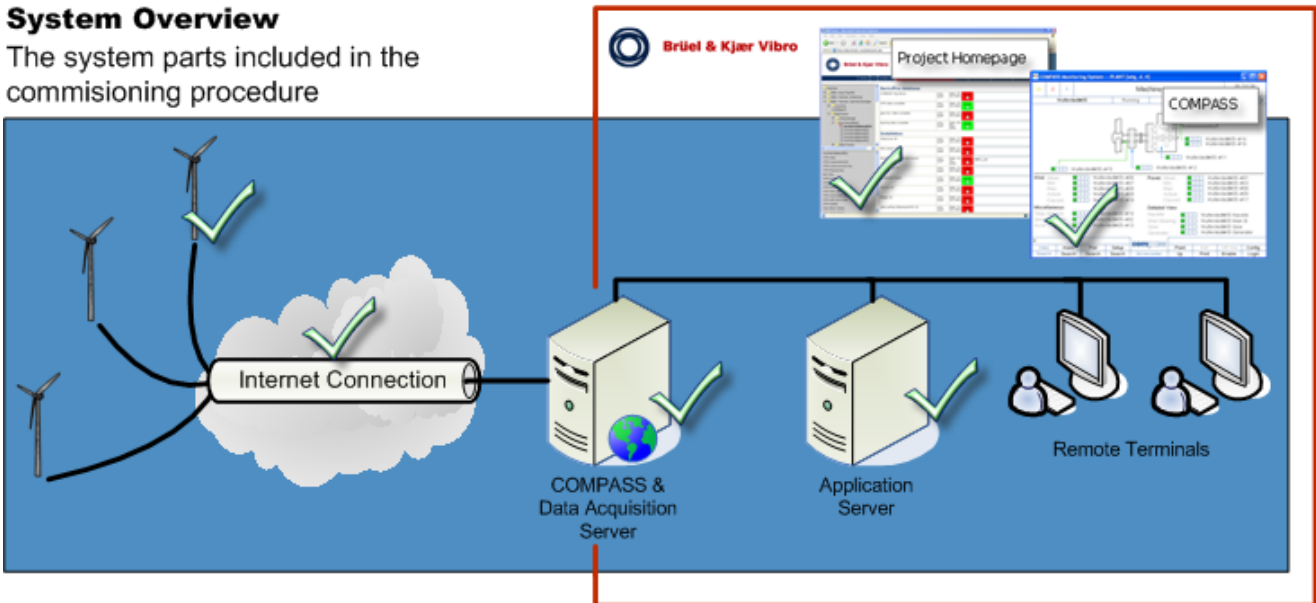
- **Back-Office Check & Setup** – where it is checked, that measurements from the turbine are received and stored in the database, and that all Danger and Alert limits are set correctly.

When these three steps have been completed the Commissioning Report can be issued.



System Overview

The system parts included in the commissioning procedure



Information Collection

Early establishment of the necessary information is essential for an orderly and effective commissioning procedure where the monitoring system is checked, and finally brought into operation. All information collected in this process is stored in a database and is available via the Project Homepage.

The table below shows the different types of information which is required and their use in the different parts of the monitoring system. The green fields indicate where the collected information is mandatory for the equipment to work as it should or for the required service to be performed properly.

Project Homepage information and its use	DDAU/II / WEB Server	COMPASS	Diagnostics	Alarm Reports	Status Reports
Type of Information					
Country					Green
Site Name					Green
Site ID					Green
Responsible Service Business Unit (SBU)					Green
Turbine System ID					Green
Turbine Type	Green				Green
Turbine Number	Green				Green
Controller Type and Manufacturer	Green				Green
Main Bearing Type	Green				Green
Gearbox Type, Manufacturer, Serial No., Gearbox Revision	Green				Green
Gearbox Ratios	Green				Green
Gearbox Drawings					Green
Gearbox Bearing Types					Green
Generator - Type, Manufacturer, Serial Number					Green
Generator Bearing Type					Green
Process Values – via AP Protocol or Hardwired - Scaling	Green				Green
Network Type – GPRS or LAN					Green
Network Addresses assigned to DDAU/II, WEB Server and Controller	Green				Green
Deviation from Normal – Photos etc.					Green



The required information and its use. To the right, an example of a sensor on a gearbox.

Installation Check

This is the phase where the data acquisition unit in the wind turbine is brought into operation. The prerequisite for the installation check is that the turbine fitter has performed the initial installation on

location, in the turbine. All check operations are done via the remote connection by the Brüel & Kjær Vibro Remote Monitoring Group.

- **Upload new firmware** -If required the firmware of the WTAS 3652 is uploaded with a new version. This will happen if new functionality has been added.
- **Upload Object Model** - The Object Model corresponding to the specific turbine type is uploaded. The object model contains all the correct measurement specifications for the machine components mounted in the turbine.
- **Internal Network Connection** - Check of connection between the WTAS 3652 WEB Server and the DDAU II.

Monitoring System Check and Setup

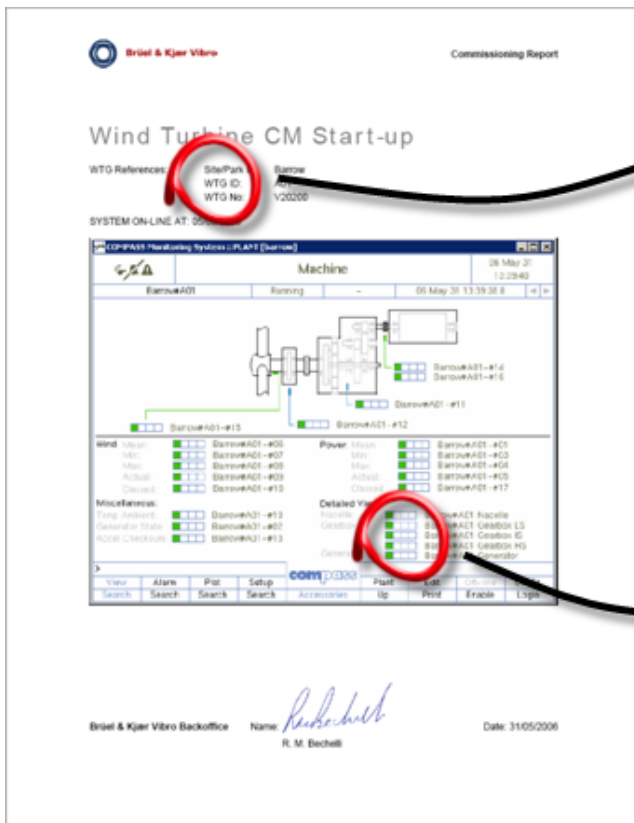
This is the phase where the monitoring system on the database servers located at Brüel & Kjær Vibro is enabled for the turbine under commissioning.

- **Check of database setup** for the specific turbine. The setup must correspond to the turbine type and uploaded object model.
- **Set Alert Limits** - The Alert Limits are set to their Default value on all measurements.

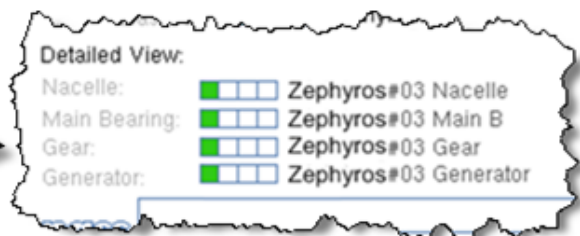
The Commissioning Report

- **Update the Project Homepage** - Fill in the Project Homepage with details about the object model and firmware versions of the WTAS 3652
- **Check Transducers** - Check of all bias voltages for all transducers, this will ensure that there is a connection to all transducers and that they are working correctly
- **Check Process Values** - Check that values retrieved via the turbine controller are within the required range.

- **Verify Danger Limits** - Verify that preset Danger Limits are present on all measurements.
- **Alarm Manager** - Set up of Alarm Manager criteria if a new Object Model is applied for the new turbine.
- **Alarm Manager** - Setup of surveillance start date and mail recipients in Alarm Manager
- **Data Storage** - Check that measured values are stored in the database.



Heading showing turbine identification, and the time when the turbine went on-line.



Traffic lights showing the state of the measured values on the turbine components.

The commissioning report is a one page document confirming that all measurements are enabled and stored in the database. The green traffic light shows that the measured values are below Danger and Alert limits.

Glossary

Alarm Manager – This is an intelligent application program used to keep track of the alarm status of all the measured values. From the alarm pattern the Alarm manager makes an assessment of the damage to a machine component expressed as an Alarm Severity Class graded from Severity 4 to Severity 1. Severity 1 is the worst case.

Alarm Report – An alarm report is issued by the Condition Monitoring Analysts at Brüel & Kjær Vibro when an alarm is received from the Alarm Manager. The Alarm Report shows what has been observed, an interpretation of the observation and advice of what to do as a reaction to the Alarm Report.

Alert Limit - Alert alarms indicates that a significant vibration level indicated by the Alert limit has been reached. Although it does not mean that the machine is in imminent danger, it does indicate that a fault could be developing and thus require attention to investigate the problem. In COMPASS the Alert Limit is indicated by a yellow line in the trend history plot. A yellow traffic light in COMPASS indicates that the Alert limit is exceeded.

Back Office – The monitoring system, database servers, and software applications developed and installed at Brüel & Kjær Vibro used for the remote monitoring reporting tasks.

COMPASS – The Brüel & Kjær Vibro vibration monitoring system used for trending and long term storage of measured values.

Danger Limit - Danger Alarms indicates that a critical vibration level indicated by the Danger Limit has been reached. This limit indicates that a fault has developed to a serious level. If the values of RMS measurements (Root Mean Square) reach the danger limit the problem requires immediate action. Danger alarms on other measurement types indicate that a severe fault is developing. However, still with some lead time to act. Any turbine where one of the measurement types has crossed the Danger limits shall be paid special attention.

Danger limits for RMS values are established from international standards such as ISO 10816. The Danger limit is indicated as a red line in the trend history plots. A red traffic light in COMPASS indicates that the Danger limit is exceeded.

WTAS 3652 – Wind Turbine Analysis System. Consists of the Digital Data Acquisition Unit II (DDAUII) and a WEB Server EQ2494 or EQ2495. The DDAU II is a device able to measure more than 100 scalar values along with the recording of long time records on 16 measurement channels simultaneously. Very well suited for detailed frequency and time record analysis with very high resolution. The WEB Server is connected to the DDAU II and takes care of all communication of data to and from the turbine.

Diagnosis – or vibration diagnosis. This is the process where a mechanical fault is referred to a specific machine part. This may be a fault such as an inner ring defect on a Generator Drive End bearing. Knowledge of kinematical data such as bearing types and gearbox data are essential for making machine diagnosis and root cause analysis.

Firmware -The software program which resides in the DDAUII local memory. The firmware modules implement the functionality of the different analysis components, filters, RMS Detectors etc.

Project Homepage – The Project Homepage is a tool used in the daily work in the Remote Monitoring Group. Data collected during the commissioning procedures is stored in a database. This database is accessed through the WEB based Project Homepage. Also other data related to the daily operation of the system are stored and accessed via the Project Homepage.

Status Report – This is issued every half year for each turbine from the Brüel & Kjær Vibro Condition Monitoring Analysts. The report provides an overview of the turbine operation over the past half year and an assessment of how the turbine will run for the next half year.

Brüel & Kjær Vibro reserves the right to change specifications without notice

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