Brüel & Kjær Vibro

Product Specification

Diagnostic Data Acquisition Unit II (DDAUII) - Type 2540

The (DDAUII) is designed for remotely acquiring scalar vibration data, process parameters and time series vibration data. 16 channel synchronous recording of time series vibration data along with a snapshot of all scalar vibration data and process values can be initiated by an external remote command, an external trigger signal or when a combination of measured scalar values falls within certain pre-defined intervals.

Features

- 16 Differential AC/DC Input Channels (4-20mA or constant current supply for Accelerometers. Channel 15 and 16 can be configured as PT-100 Temperature Inputs
- 4 Digital Inputs
- 2 Relay Outputs
- 4 Ethernet connections with switch functionality. Including one optical connection.
- Service Display for on-site check of network connections and measured values.
- Continuous measurement of characteristic scalar values
- Synchronous recording of time waveforms on up to 16 channels
- Snapshot of all scalar values recorded along with the time waveform.
- Triggering of time waveform recording by the combined state of a number of measured scalar values.
- Triggering of time waveform recording by an external input signal.
- Triggering of time waveform recording by an external command via the WEB interface.
- Storage of data in a large ring buffer allows detailed analysis of time waveforms recorded before, during or after the trigger conditions were fulfilled.

Fig. 1: DDAU II –shown in its IP66 enclosure in connection with the WEB Server and Power Supply

Application

Together with WEB Server EQ2494 (GRPS Modem) or EQ2495 (LAN connection) DDAUII is specifically designed for cost-effective remote, wireless or LAN based measurements on a large number of machines.

DDAUII makes simultaneous, continuous measurements of a large number of scalar vibration and process values used for reliable condition monitoring. At the same time DDAUII provides the best possible conditions for advanced vibration diagnosis by recording time waveforms. Time waveforms are uploaded to a central server for long term storage and further analysis by use of the Type 7125 WTG Analyzer.

Recording of Time Waveforms

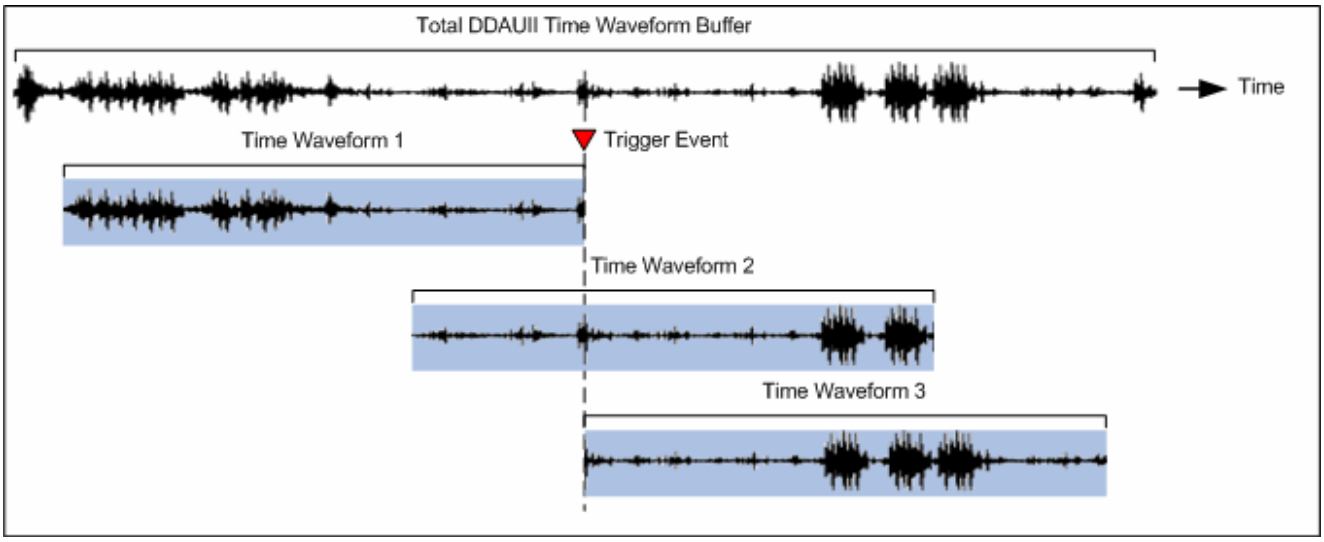


Fig 2: Illustration of the Trigger Delay Function in the DDAUII

Time Waveforms can be synchronously recorded on all or a specified selection of the 16 input channels as a reaction upon a trigger event.
A large buffer used for the time waveform recording makes it possible to offset the trigger event with respect to the beginning and end of the requested time record. It is thus possible to capture events before the trigger event (Time Waveform 1), on either side (Time Waveform 2) or after the trigger event has happened (Time Waveform 3).

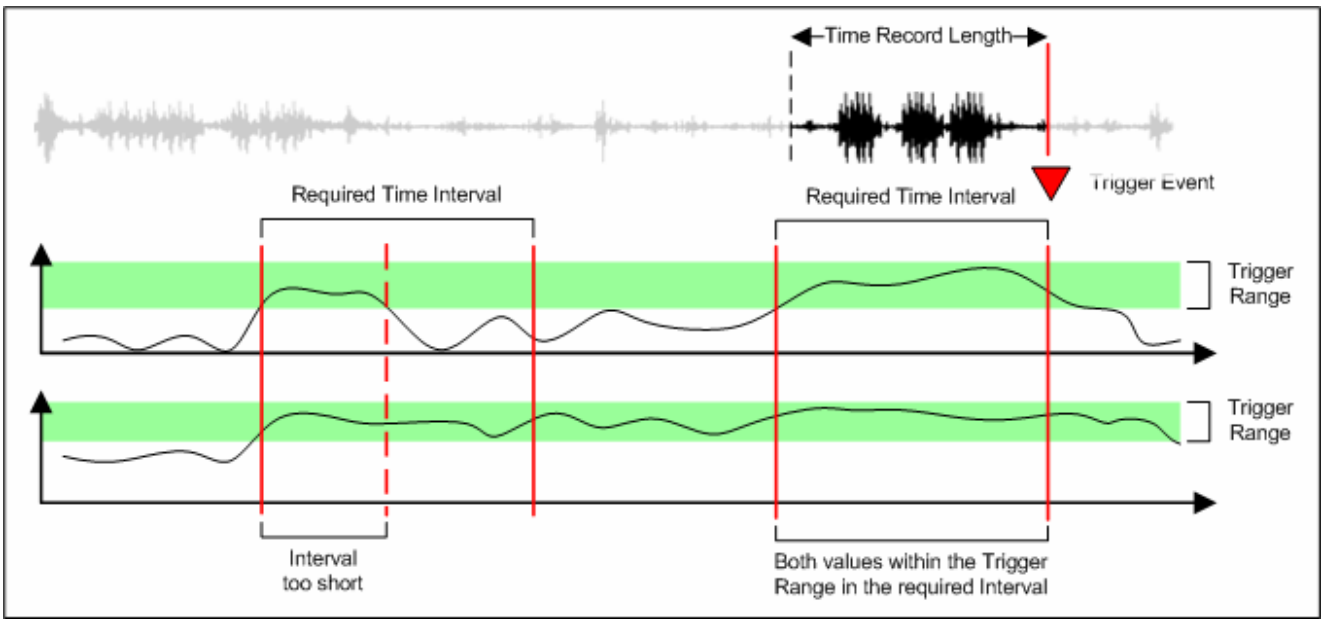


Fig 3: Illustration of Range Trigger principle in DDAUII. The highlighted part of the time waveform is returned.

A recording can be triggered in three different ways:

- Command Trigger - The trigger signal is generated by an external command sent to the DDAUII via the web interface.
- Digital Input Trigger – The trigger signal is generated when the state changes on one of the Digital Input Channels

- Range Trigger - The trigger signal is generated by a combination of values measured by the DDAUII. When each of the selected trigger condition values are within a specified range for a certain time interval the trigger condition is valid. Up to three values can be used to define the trigger conditions.

Several different trigger conditions may be simultaneously defined in the DDAUII. As the trigger conditions are fulfilled, the data are measured and transmitted to the remote server. A snapshot of all measured scalar values is attached to each time waveform for a complete description of the state of the machine at the time of recording.
The maximum record length to be recorded by the DDAUII buffer varies between 80 seconds and up to 5 minutes depending upon the amount of memory mounted in the DDAUII.

Measurement of Scalar Values

The measurement configuration of the DDAUII is downloaded from the remote server before the monitoring starts, typically at the time of commissioning the machine monitoring system. Different machines may require different monitoring strategies, therefore different object models can be downloaded to the DDAUII, thus changing the behavior of the unit. Object models are composed by a selection of firmware components, such as Sensors, Filters, Detectors etc.. To illustrate the object model the firmware components are organized in a signal flow chart.

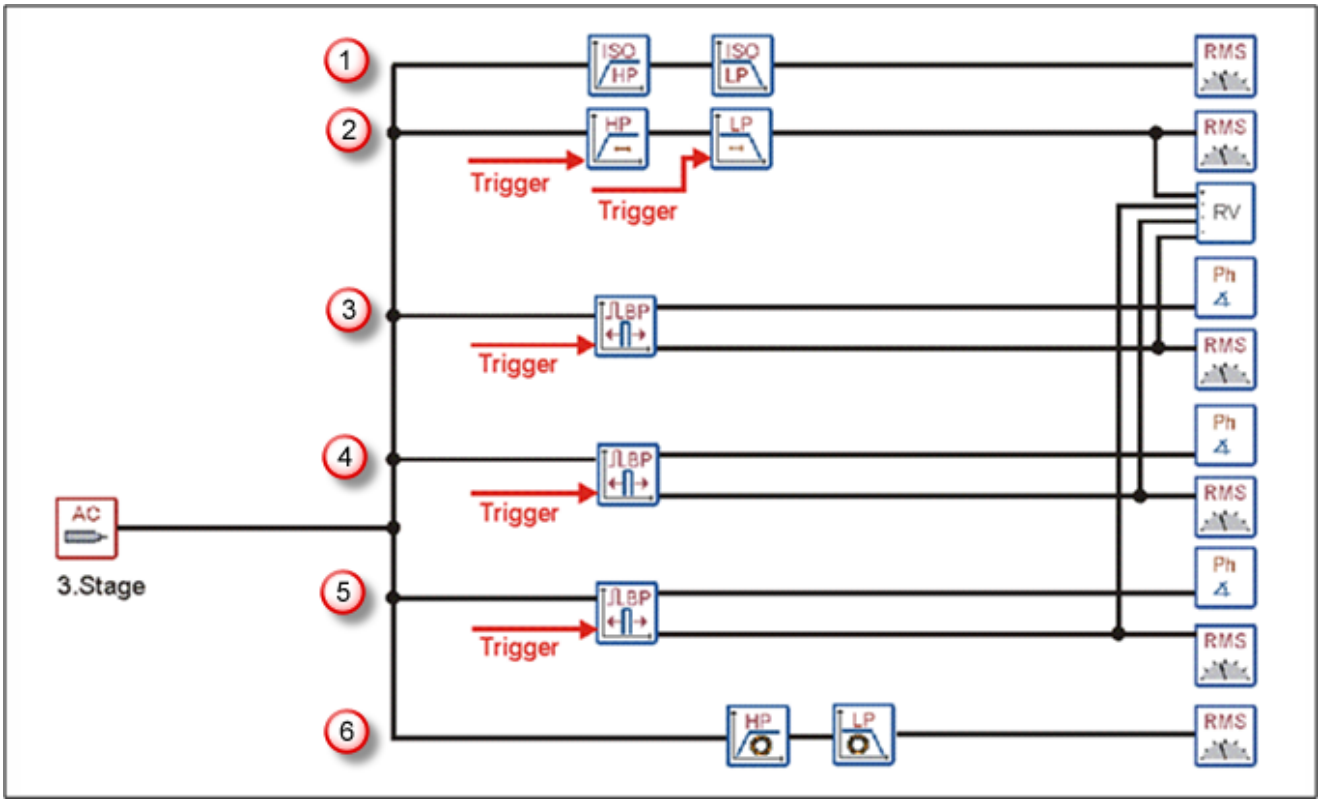
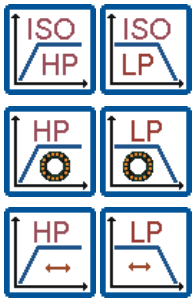


Figure 4: Part of an object model showing firmware blocks related to the sensor on 3rd stage of a gearbox

The signal flow chart example shows how the 3rd stage of a gearbox is monitored using characteristic scalar values.
The sensor component (AC) shows that an accelerometer is used as transducer. The branch marked as (1) shows the firmware components for the filtering provided for the Overall ISO RMS measurement. This measurement is fixed in a standardized frequency range. The branches (3), (4) and (5) are tracking filters measuring the 1st, 2nd and 3rd. harmonic of the tooth meshing frequency. As the tooth meshing frequency varies according to the running speed of the machine, these firmware blocks use the trigger signal from the speed sensor to adjust the centre frequency of the filter to track the tooth meshing frequency. Both the “Magnitude” (RMS) and the “Phase” value are measured.

The filter in branch (2) has also limits controlled by the speed of the machine. These two filters are used to calculate an RMS value comprising all three tooth meshing frequencies. By using the Residual Value block (RV) the output from branch (3), (4) and (5) is subtracted from the output from branch (5) to provide an indication of the RMS level in-between the tooth meshing frequencies, thus indicating if any sidebands indicating serious gearbox damage are present. The filter in branch (6) is designed to catch bearing defect frequencies.

The firmware components available in DDAUII are shown in the table below.

	**Sensor**	Firmware component for conditioning of a single AC channel. It defines all input channel properties including sensor parameter settings (e.g. sensitivity, OK range, etc.)
	**Trigger**	Firmware component for the continuous conditioning of one incoming trigger signal. It converts the digital time series (time signal) into a series of trigger events by comparing the time signal against a trigger threshold.
	**Filter**	Firmware components for the continuous signal filtering of AC- and AC/DC-signals. It consists of a low pass filter and a high pass filter Mainly three versions are used: ISO filter with lower frequency of 10 Hz and an upper frequency of 1000 Hz. HFBP Filter for the monitoring of ranges from 1 kHz to 10 kHz. Variable Filter for overall value calculation of variable speed machines
	**Bandpass Filter**	Firmware component for accurate measurement and calculation of the magnitude and phase of a signal. The centre frequency can be related to a trigger signal (i.e. tracking) or can be fixed (i.e. absolute frequency).
	**Rms Detector**	Firmware component which makes the RMS calculation of the amplitude information of a filter
	**Phase Detector**	Firmware component calculating the phase value of a bandpass filtered signal in the range of 0-360°.
	**Residual Value**	Firmware component which subtracts narrow band measurements from an overall RMS value.
	**Speed**	Firmware component for measuring the speed out of a trigger signal.
	**DC Voltage**	Firmware component for measuring DC voltage on one channel. It defines all input channel properties including sensor parameter settings (sensitivity, OK range, etc.)
	**Statistics**	Firmware component for processing of DC measurements. Output is the **mean, max** and **min** value in a defined time period.

The Service Display

The DDAUII is equipped with a service display to support the activities during installation and maintenance. The service display shows the IP Addresses, levels of Analog and Digital inputs, state of the relays etc.

Hardware Input Channels

Each of the 16 differential AC/DC input channels can be freely configured in the following ways:

- As Accelerometer Input: An input with constant current supply for direct accelerometer input.
- As 4-20mA Input: To receive analog signals directly from other units.
- As Trigger Input: For speed measurements and tracking.
- As PT-100 Input: In addition to the 3 input configurations valid for all channels, 2 of the 16 channels can be configured as PT-100 inputs to be used in connection with temperature sensors.

Ethernet Connection

The DDAUII has a built–in network switch with four ports. Three RJ-45 connectors and one optical fiber.input. The RJ45 ports have auto detect functionality, facilitating the use of crossed as well as non-crossed cables.
The switch functionality makes it very easy to connect the DDAUII to other equipment or to daisy chain several DDAUII units.

Technical Specifications

AC/DC Inputs

16 differential AC, DC and Trigger inputs.
Input impedance: 50kΩ
Common rejection Mode.....>40dB
Input impedance 50kΩ
Common rejection Mode .....>40dB

Input voltage range:
Positive ..... -1.5 to +25.5VDC
Negative..... +1.5 to -25.5 VDC

Accuracy:
AC amplitude .....±0.5dB
DC amplitude.....1% ±40mV offset

Bandpass filter:
Frequency range (absolute) .....0.1Hz to 10kHz
Filter slope ..... 18dB/oct. Butterworth

Narrow-band filter:
Frequency range (absolute) .....0.1Hz to 10kHz
Bandwidth ..... 1 to 50%

Dynamic range.....90dB
Resolution 24bit
Sampling frequency .....25.6kHz ±0.1%
Transducer power..... 5mA at 26VDC

Digital Inputs

4 galvanically isolated digital inputs.
Input impedance 2.7kΩ

Nominal signal voltage:
Low range ..... -33V to +2V
High range .....+18 to +35V
Maximum voltage: .....±50V

Digital Outputs

2 relays with dry contacts, type SPDT.
Nominal working voltage.....24V
Maximum current 100mA

Serial Interfaces

RS-232:
Baud rate .....up to 115kBaud
RS-485:
Baud rate .....up to 115kBaud

Network Interfaces

4 Ethernet Connections with switch functionality

3 RJ45 connectors
With auto detect facility for detection of crossed/non crossed cables

1 optical port SFPT)
The SFPT (Small Form Factor Transceiver) accepts among several, a Duplex LC optical interface for multimode fibers.

General Specifications

Power supply:
Voltage.....22 to 26V
Power consumption 20VA
Transducer power supply range . 26V±10%, 100mA

Physical size:
Height.....45mm
Width.....280mm
Depth 250mm

Environmental

Damp heat, Dry heat and Salt mist test has been carried out with the unit mounted in the IP66 enclosure. (Picture on front page). Other specifications are valid for the unit itself.

Vibration
IEC 60068-2-6 Resonance search
- Frequency/Amplitude.....10-150Hz 1.0g
- Sweep rate.....1 octave/minute
- Number of axes: .....3-mutually perpendicular

IEC 60068-2-64 Random
- Frequency/Amplitude:.....10-150Hz
- Acceleration:..... 10-20Hz 0.01g/Hz
- Spectral Density: 20-150Hz 3db/oct
- Total RMS:..... 0.7g RMS
- Duration: .....90 min per axis
- Number of Axes:.....3, mutually perpendicular

Damp Heat
IEC 60068-2-30 Cyclic
- Upper temperature .....+55°
- Number of cycles:..... 6
- Acceleration:.....10-20Hz 0.01g/Hz

Dry heat
IEC 60068-2-2
- Temperature .....+70°C
- Duration: .....16 hours

Cold
IEC 60068-2-1
- Temperature: ..... -40°C
- Duration: .....16 hours

Salt mist
IEC60068-2-52
- Severity 2: .....NaCl concentration: 5%
- pH of salt solution: 6.5-7.2
- Number of cycles: 3
- Duration ..... 3 days

EMC
EN 61000-6-4, 2001 Generic Emissions standard.
Part 2: Industrial Environment
EN 61000-6-2, 2001 Generic Immunity standard.
Part 2: Industrial Environment

Related Products

Type 7125 Data Subscription Service
This service is intended for users having in-house expertise of condition monitoring and diagnosis but do not want to host and maintain the IT system used for the monitoring system. By purchasing this service the user has full access to all data from the machine. The subscriber is notified by e-mail upon a progressing fault on a turbine. A full overview of the Severity Status of all turbines is available on the homepage. Data for analysis and reporting are downloaded from the Data Subscription Homepage. The WTG Analyzer, also downloaded from the Data Subscription Homepage, is an essential part of this service
Condition Monitoring and Diagnostic Service
This service offers 24/7 monitoring and diagnosis of your wind turbines performed by experts at Brüel & Kjær Vibro. An alarm report is issued each time the vibration level of the turbine reaches a new severity level. Each report contains the Observation, Interpretation and Advice for further action. In addition to the Alarm Reports, this service provides a status report every half year. The status report contains the current status of the turbine, service history through the previous period, a prognosis of the turbine health for the coming period and plots of vibration data. The Condition Monitoring and Diagnostic Service can be purchased in combination with the Type 7125 Data Subscription Service if users want to make their own assessments and reports.

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

Brüel & Kjær Vibro A/S
2850 Nærum – Denmark
Tel.: +45 77 41 25 00
Fax: +45 45 80 29 37
E-mail: info@bkvibro.com

Brüel & Kjær Vibro GmbH
64293 Darmstadt – Germany
Tel.: +49 (0) 6151 428 1100
Fax: +49 (0) 6151 428 1200
E-mail: info@bkvibro.de