EXPRESS DIAGNOSTICS OF BEARINGS AND OIL CONDITION!

THE DEVICE FOR BEARING MONITORING USING THE SHOCK PULSE METHOD

BALTECH VP-3450

BALTECH

RELIABILITY TECHNOLOGIES

- PRODUCTION OF VIBRATION DIAGNOSTICS SYSTEMS
- MONTHLY TRAINING AT THE TRAINING CENTRE
- VIBRATION CORRECTION ON THE CUSTOMER'S PREMISES
- MAINTENANCE AND REPAIR OF DIAGNOSTICS SYSTEMS
- METROLOGICAL ASSURANCE

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The bearing condition is estimated according to the color condition scale:

- red– good condition
- yellow– warning
- red – damage

The measurement modes are set using the device keyboard. According to the BALTECH conception «Reliability technologies» after the bearing condition monitoring it is necessary to check for unbalance and misalignment condition.

After bearing replacement we recommend to perform alignment with BALTECH SA-4300 and dynamic balancing with BALTECH VP-3470.

BALTECH VP-3450 APPLICATION

The device for bearing diagnostics using the shock pulse method (further - tester) is designed to monitor rolling element bearings and oil condition in rotating machinery, check of equipment mechanical condition for mechanical damages.

The main function of the tester is to measure bearings in operation using the shock pulse method.

The monitoring of bearing and oil condition allows you to:

- Avoid unnecessary examination and repair when machine is in good working condition;
- Avoid schedule replacement of bearings that are still in good working condition;
- Timely detect hidden defects to avoid accidents and downtime.

DESIGN AND OPERATION PRINCIPLE

The sensor mounted in the handle is connected with the device via the cable. The tester has an ABS plastic housing and consists of a single-chip microcontroller, LCD and film keyboard on the front panel. The batteries are in the battery cabinet. The battery cabinet cover is fixed with screws. The outputs for the sensor and headphones are on the bottom panel.

During measurement the sensor is connected to the tester via the cable and is pressed to the bearing cover with the probe.

SHOCK PULSE METHOD

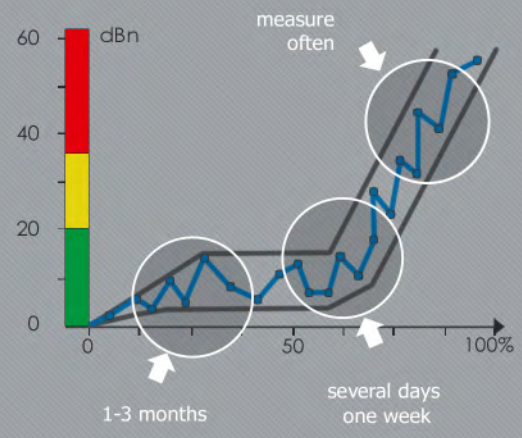
Installation, operation, repair and maintenance are main factors that influence bearing life. Periodic bearing monitoring during its operation is the best way to prevent its damage and costly repair.

There are several bearing monitoring methods: temperature measurement, vibration measurement, sound measurement and shock pulse method. The shock pulse method allows measuring bearing condition during normal bearing operation without vibration influence from machine or bearing.

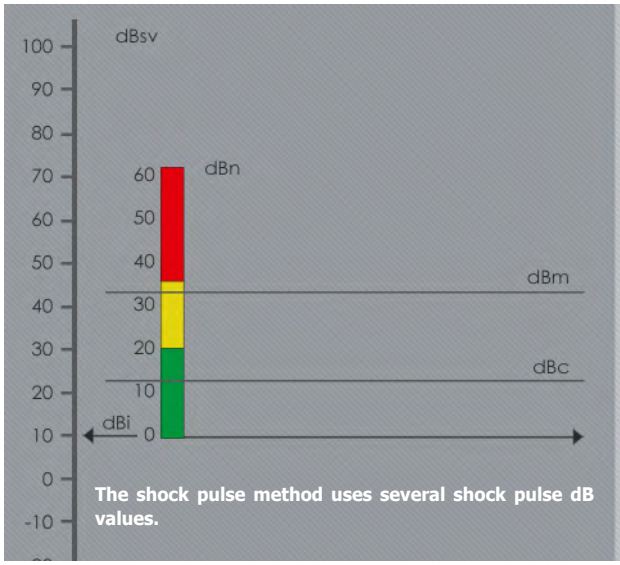
The shock pulse method allows timely detecting bearing defects resulted from improper manufacture, improper assembly, improper lubrication and scratches on rotation surfaces.

Bearing condition is determined by the shock pulse method as follows: initially a new bearing has a low shock pulse value and if this value increases up to 1,000 times of the initial shock pulse value, it means that the bearing life has expired.

BEARING DEGRADATION PROCESS



Shock pulse strength depends on a shock velocity V, if A represents a shock pulse peak value, then there is a relation of A = f (V), while the shock velocity V also depends on a bearing size, rotation speed and defect size.



The shock pulse method uses several shock pulse dB values.

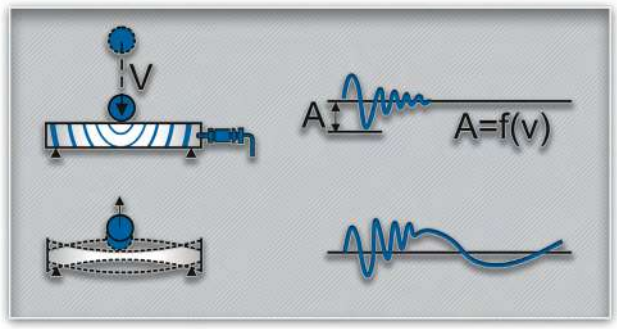
dBsv (decibel shock value)
The absolute shock pulse dB value

dBi (dB-initial)
The initial dB value. This is an average value obtained from a variety of tests and measurements conducted on new bearings, and correction of different bearing operation and their rotation speed according to dBn standard.

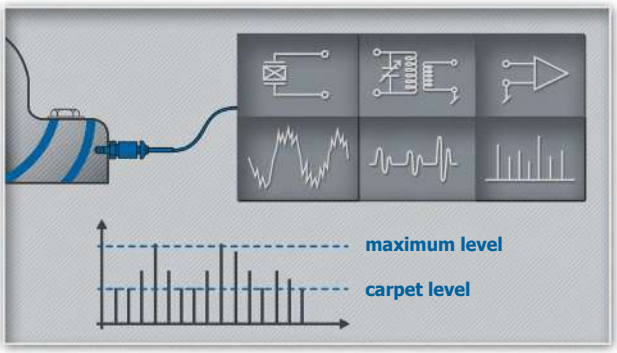
dBn (dB-normalized).
The standard dB value. It is a standardized measurement and scale unit used as a standard to estimate bearing condition.

dBm (dB-maximum value)
The maximum dB value obtained from the bearing shock pulse measurement and used to measure the bearing damage severity.

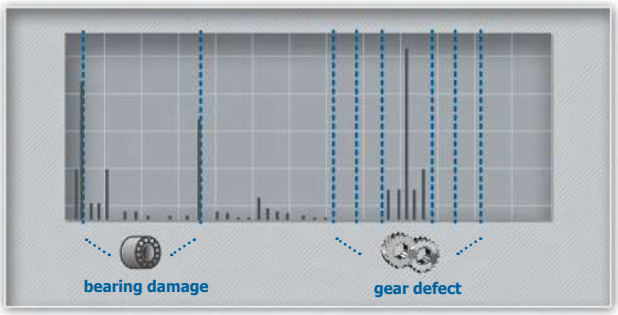
dBc (dB-carpet value)
The carpet value, another dBn value used to measure bearing surface roughness, installation and lubrication condition.



The shock pulse method can be illustrated by the example of a metal ball fall on a metal object. The shock waves will appear in both objects. The shock pulse amplitude is equal to the impact velocity function.



Total shock pulse intensity increases with decreasing of lubrication film thickness. Pronounced shock pulse peaks indicate bearing defects.



The bearing vibration monitoring allows detecting irregularities in equipment, and to define the reason of such irregularities the spectral vibration diagnostics should be used.

WORK WITH THE TESTER BALTECH VP-3450

Establishment of the equipment monitoring system
In order to obtain accurate and reliable readings using the tester BALTECH VP-3450 two main requirements should be met:
- Choose a measurement point according to SPM rules;
- Calculate a correct initial dBi value according to a bearing diameter and rpm.

There are conditions under which the shock pulse measurement doesn't provide reliable results:
- Low rotation frequency or irregular loads;
- Interference from other pulse sources;
- Quick damage process;

To ensure efficient bearing monitoring the following conditions should be met:
- Careful preparation for obtaining effective initial values of good bearing and equipment condition
- Planned and perfect procedure of periodic data collection;
- All-around evaluation of any result deviating from the good condition.

Measurement range BALTECH VP-3450
The measurement range of BALTECH VP-3450 allows measuring bearings with the maximum permissible rotation frequency up to 19,999 rpm and maximum dBi of 40. The minimum permissible dBi value is -9dBi; the real limit is 0 dBi value, as in case of low values for low-speed bearings it is almost not possible to obtain useful information on the bearing condition.

Measurement interval
Normally, a bearing damage develops very slowly, and a measurement interval is determined according to the following rules:
- Bearings should be inspected at least once a month;
- Critical equipment and heavily loaded bearings shall be measured more frequently than standard bearings;
- Bearings should be monitored more frequently if their measuring values are not stable;
- Damaged bearings should be monitored as frequently as possible.

Note: After bearing lubrication at least one hour should go by before start operating it.

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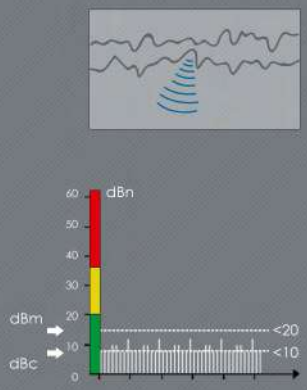
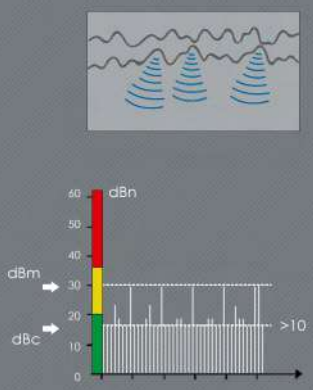
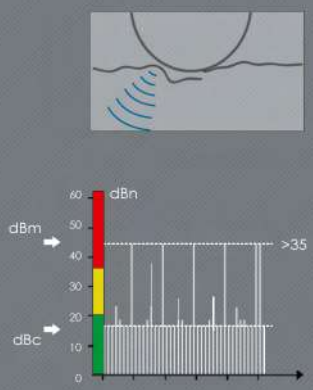
Standard bearing operation modes



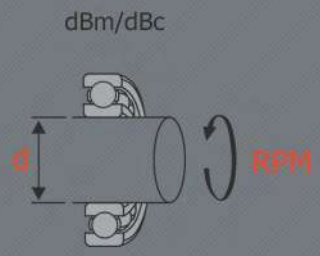
Bearing in good working condition



Bearing damage at an early stage of development



Bearing with severe damage



Technical characteristics of BALTECH VP-3450	
Shock pulse measurement range, dBsv	-9 ~ 99
Resolution, dBsv	1
Maximum absolute error, not more than dBsv	±2
Supply voltage, V	9
Dimensions, mm	255x105x60
Weight, kg	0,8

Delivery set of BALTECH VP-3450

1	Measurement unit	1
2	Sensor with cable	1
3	Headphones*	1
4	Screw driver	1
5	Battery, type AA	6
6	Checklist	1
7	Operation manual	1
8	Transportation case	1

***Headphones**

The headphones can be used to determine a shock pulse source. The operation principle is as follows- if the shock pulse value is higher than the measuring interval, the impulse is audible; If the measuring limit is higher than the largest shock pulse value, the sound is unheard. The more impulses exceed the range, the more frequent the impulse sound is. When the range is close to dBc, the sound in the headphones becomes continuous.

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