

# ISO 20816 vibration severity zones: how to use them and where not to

After reading, you can track a machine's broadband vibration against its own baseline and read the ISO 20816 zones in the right context, without treating a zone as a fault diagnosis.

## In short

- ISO 20816 zones rate broadband vibration severity, and their boundaries depend on the machine group and its support.
- A zone letter does not name a fault, so it cannot replace spectrum analysis or trend tracking.
- Compare readings taken at the same points, loads and speeds, and judge any change against the machine's own baseline.

## 01 / From ISO 10816 to ISO 20816

The ISO 10816 series was widely used to judge the vibration severity of machines. It has been revised into the ISO 20816 series. Part 1 gives general guidelines, and further parts cover specific machine types. The standard evaluates broadband vibration severity, usually expressed as the RMS velocity in mm/s, measured on bearing housings under steady operating conditions.

The applicable band and limits depend on the part of the series and on the machine class. This article does not quote numeric limits. For the values that apply to your machine, go to the relevant part of the standard and read its text.

## 02 / Zones A, B, C and D

The standard places a measured severity into one of four evaluation zones. Zone A is typical of newly commissioned machines. Zone B is acceptable for unrestricted long-term operation. Zone C is usually considered unsatisfactory for long-term continuous operation. Zone D is severe enough to cause damage.

Zone boundaries depend on the machine group, its size and power, and the stiffness of its supports. The same velocity value can therefore fall into different zones on two machines. Read a zone together with the machine's definition and the relevant part of the standard, not from the number alone.

## 03 / What the zones do not tell you

A zone letter does not name a fault. A severity value cannot tell you whether the cause is a gear, a bearing or looseness. For that reason the standard does not replace spectrum analysis or trend tracking. When a high overall value appears, the cause has to be found with an FFT spectrum, envelope analysis or the operating context. A value close to a zone boundary does not mean danger on its own; its closeness should be read against the machine's own trend.

Measurement settings also matter. If the band or the units differ between readings, the values cannot be compared directly. Placing a low-frequency measurement next to a high-frequency one in the same zone

table can give a misleading picture.

### 04 / Worked example: change from the machine's own baseline

Hypothetical example. Consider a pump bearing housing measured at the same point, under the same load and speed, on two dates. Suppose the baseline reads 2.0 mm/s RMS and the later reading is 3.0 mm/s RMS. These values are not compared with any limit; the example only illustrates a change. The change is  $(3.0 - 2.0) / 2.0 = 0.5$ , that is, a 50 % rise over the baseline.

A rise of that size is a reason to look more closely at the same machine's history. To find the cause, examine the spectrum, temperature and load recorded at the same time. A single reading is not enough to make a decision.

### 05 / Measurement discipline and alert levels

To build a baseline you can trust, define a recording routine for each measurement point, direction, load and speed. Use the same sensor, the same band and the same units every time. Vibration can change with load, so comparisons should be made under the same load condition. A change in the sensor, its mounting or its location can also change the reading; comparing two readings without recording such a change is misleading.

Measurements during transient states such as start-up and coast-down should not be included in the same baseline as steady-state readings.

Derive alert levels from that baseline and from the guidance in the relevant part of the standard. Write down which level triggers which action, and agree on it with the maintenance team before an alarm is needed. If the levels are changed later, note the reason for the change.

### 06 / Where to start

Start by choosing one machine group and identifying which machines in it can be measured regularly in practice. Document each measurement point with photographs or a sketch, because the way the sensor is mounted affects the reading. Then take several readings while the machine is healthy and under normal load. Those readings form your baseline.

Record the unit, the band and the operating condition with every measurement, in a consistent format, so that a change can be calculated later. This routine lets the team take every reading the same way, so that values taken by different people can be compared. Keep these records in one table for each machine, with the date, point, load, speed and unit on every row. Before you use the standard's zones, looking at your own trend is often more informative.

### Try it

Open a built-in synthetic signal in spectra, read its overall severity and zone display, and write down how you would interpret that zone against your own baseline reading rather than on its own.

### References and online guide

[Open the online guide](#)

[Vibration \(Wikipedia\)](#)

[Condition monitoring \(Wikipedia\)](#)

[Accelerometer \(Wikipedia\)](#)

Predictive maintenance (Wikipedia)

Proposed pilot steps do not claim field accuracy. Synthetic examples are not measurements from a production site.