



Reference for Vibration

1. Vibration standards for attached machinery bearings

Speed	Amplitude (double amplitude) (mm)		
	Excellent	Good	Qualified
$n \leq 1000$	0.05	0.07	0.10
$1000 < n \leq 2000$	0.04	0.06	0.08
$2000 < n \leq 3000$	0.03	0.04	0.05
$n > 3000$	0.02	0.03	0.04

2. Unit shaft vibration standards

For units of 200MW and below, the bearings are generally measured. If the shaft vibration measurement manufacturer has no regulations, please refer to the following table.

Reference standard for shaft vibration of large turbine generator sets (double amplitude, μm)

	1500r/min		3000r/min	
	Relative Displacement	Absolute Displacement	Relative Displacement	Absolute Displacement
A(Great)	100	120	80	100
B(Qualified)	200	240	165	200
C(Shutdown)	300	385	260	320

3. Bearing vibration standards

Bearing vibration standard (double amplitude, mm)

	Excellent	Good	Qualified
1500r/min	≤ 0.03	≤ 0.05	≤ 0.07
3000r/min	≤ 0.02	≤ 0.025	≤ 0.05
$> 5000\text{r/min}$	≤ 0.01	≤ 0.025	≤ 0.05

4. ISO 3945 vibration standards

ISO 3945 vibration standards

Vibration intensity V: (mm/s)	Support classification	
	Rigid support	Flexible support
0.45	A(Great)	A(Great)
0.71		
1.12		
1.8	B(Satisfied)	B(Satisfied)
2.8		



4.5		
7.1	C(Dissatisfied)	C(Dissatisfied)

11.2	C(Dissatisfied)	C(Dissatisfied)
18	D(Stop immediately)	D(Stop immediately)
28		
45		
71		

Conversion relationship between vibration intensity V (mm/s) and vibration displacement peak value S (mm)

$$S_{p-p} = 2 \sqrt{2} V_f / \omega$$

where the angular velocity $\omega = 2\pi f$, f is the frequency.

When $f=50\text{Hz}$, the corresponding values of vibration intensity and vibration displacement are shown in the table below:

The corresponding values of vibration intensity and vibration displacement:

V_f (mm/s)	0.45	0.71	1.12	1.8	2.8	4.5	7.1	11.2	18.0	28.0	45.0	71.0
S_{p-p} (um)	4	6.3	10	16	25	40.6	63	100	162	250	406	630

5. IEC vibration standard (double amplitude, um)

IEC Vibration Standard

Rotating speed (r/min)	1000	1500	1800	3000	36000	6000	7200
Bearing vibration	75	50	40	25	21	12	6
Shaft vibration	150	100	80	50	42	24	12

6. How are my country's current turbine vibration standards stipulated?

1) When the turbine speed is 1500r/min, the double vibration amplitude of less than 50um is considered good, and the double amplitude of vibration less than 70um is qualified: when the turbine speed is 3000r/min, the double vibration amplitude of less than 25um is good, and the double vibration amplitude of less than 50um is qualified.

2) The standard also stipulates that the bearing vibration of newly installed units should not be greater than 30um.



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- 3) The values stipulated in the standard are applicable to the rated speed and any stable load conditions.
- 4) The standard stipulates the vibration measurement of bearings in three directions: vertical, horizontal and axial. When measuring vibration, the position of each measurement should be consistent, otherwise it will cause large measurement errors.
- 5) If the vibration amplitude in any of the three directions exceeds the specified value, the vibration condition of the unit is deemed to be unqualified, and measures should be taken to eliminate the vibration.
- 6) The emergency stop measures also stipulate that if the vibration of the turbine suddenly increases by 50um during operation, the turbine should be shut down immediately. At the same time, it is also stipulated that the vibration at the critical iron speed shall not exceed 100um.