$$T = T_s \times N = \frac{N}{F_S} = \frac{N}{2.56 \times F_{max}} = \frac{lines}{F_{max}}$$

T = Time required to collect the waveform

T=波形采样时间

Ts = Time between each sample

T_s=采样周期

Fs = Sampling rate = Samples per second

F_s=采样频率

N = Number of samples (1024, 2048, 4096, etc.)

N=采样点数

$$Resolution = \frac{F_{max}}{lines}$$ 谱线分辨率 = $\frac{\text{Fmax}}{\text{lines}}$

$$Bandwidth = Resolution \times Window\ factor$$

谱线带宽=谱线分辨率×窗系数

Window factor = 1 (no window/uniform/rectangular) or 1.5 (Hanning window)

窗系数=1（不加窗/标准窗/矩形窗）或 1.5（汉宁窗）

Separating frequency ≥ 2 x Bandwidth ≥ 2 x Resolution * Window Factor

分离频率≥2×带宽≥2×谱线分辨率*窗系数

Required spectral lines ≥ 2 x Window factor x Fmax / Separating frequency

需要的谱线数≥2×窗系数×F_{max}/分离频率

Accuracy of frequency (at peak) = ± ½ x Resolution
频率精度（谱峰）=±1/2×谱线分辨率

Prime numbers: 1, 2, 3, 5, 7, 11, 13, 17, 19…
质数：1、2、3、5、7、11、13、17、19、……

1 inch = 25.4 mm
1 英寸=25.4 毫米

1mm = 0.039 inches
1 毫米=0.039 英寸

Trial weight calculation:
试重计算公式：

$$W = \frac{F}{K \times R \times N^2}$$

W：试重，克

F = 10% of rotor mass divided by the number of bearings in kg
F=10%转子质量除以轴承的数量，千克

K = 0.011
K=0.011

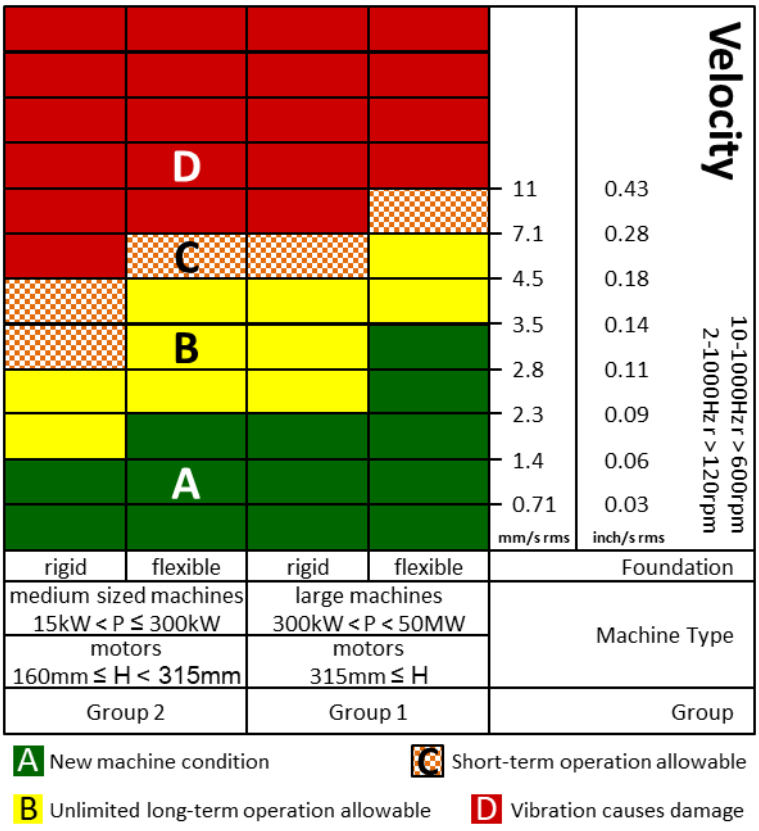
N = RPM/1000
N=每分钟转速/1000

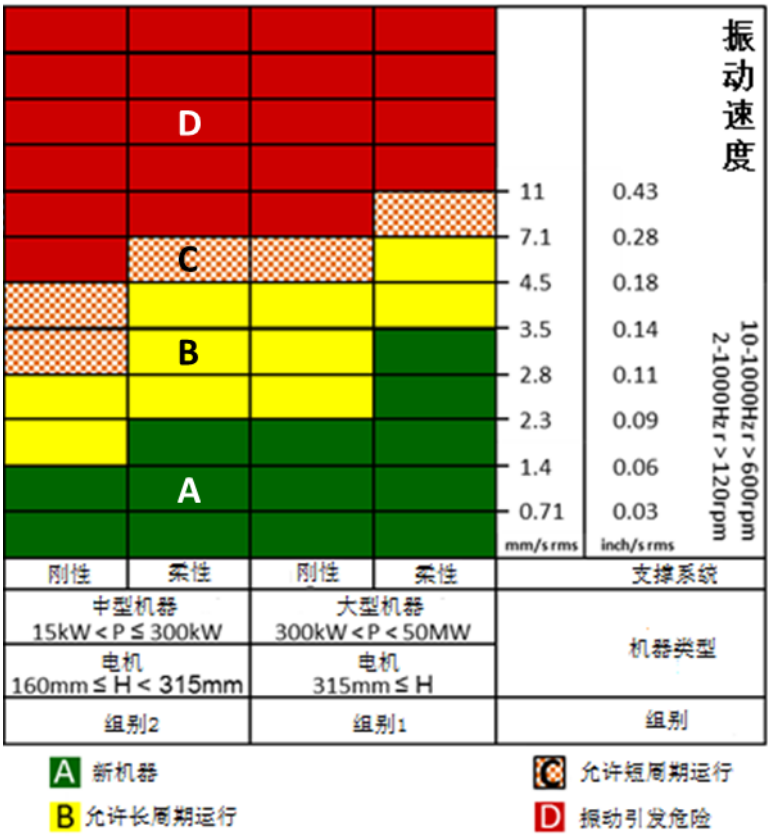
R = Radius in cm
R=试重半径，厘米

Unit Conversions（单位转换）

$D_{pk-pk} = \frac{19098\, V_{pk}}{f_{cpm}}$ $\quad V_{pk} = \frac{5217\, A_{rms}}{f_{cpm}}$	$D_{pk-pk} = \frac{27009\, V_{rms}}{f_{cpm}}$ $\quad V_{rms} = \frac{93712\, A_{rms}}{f_{cpm}}$
$D_{pk-pk} = \frac{9.958x10^7 A_{rms}}{f_{cpm}^2}$ $\quad A_{rms} = \frac{f_{cpm} V_{pk}}{5217}$	$D_{pk-pk} = \frac{2.53x10^9 A_{rms}}{f_{cpm}^2}$ $\quad A_{rms} = \frac{f_{cpm} V_{rms}}{93712}$
$V_{pk} = \frac{f_{cpm} D_{pk-pk}}{19098}$ $\quad A_{rms} = \frac{f_{cpm}^2 D_{pk-pk}}{9.958x10^7}$	$V_{rms} = \frac{f_{cpm} D_{pk-pk}}{27009}$ $\quad A_{rms} = \frac{f_{cpm}^2 D_{pk-pk}}{2.53x10^9}$
D = Displacement: mils pk-pk D=位移：密尔 峰-峰 **V = Velocity:** in/sec pk V=速度：英寸/秒 峰 **A = Acceleration:** g rms A=加速度：g 有效值 **F = Frequency:** CPM **F=频率：转/分**	**D = Displacement:** micron pk-pk D=位移：微米 峰-峰 **V = Velocity:** mm/sec rms V=速度：毫米/秒 有效值 **A = Acceleration:** g rms A=加速度：g 有效值 **F = Frequency:** CPM F=频率：转/分 **1g rms = 9.8m/sec²** 1g 有效值=9.8 米/秒²

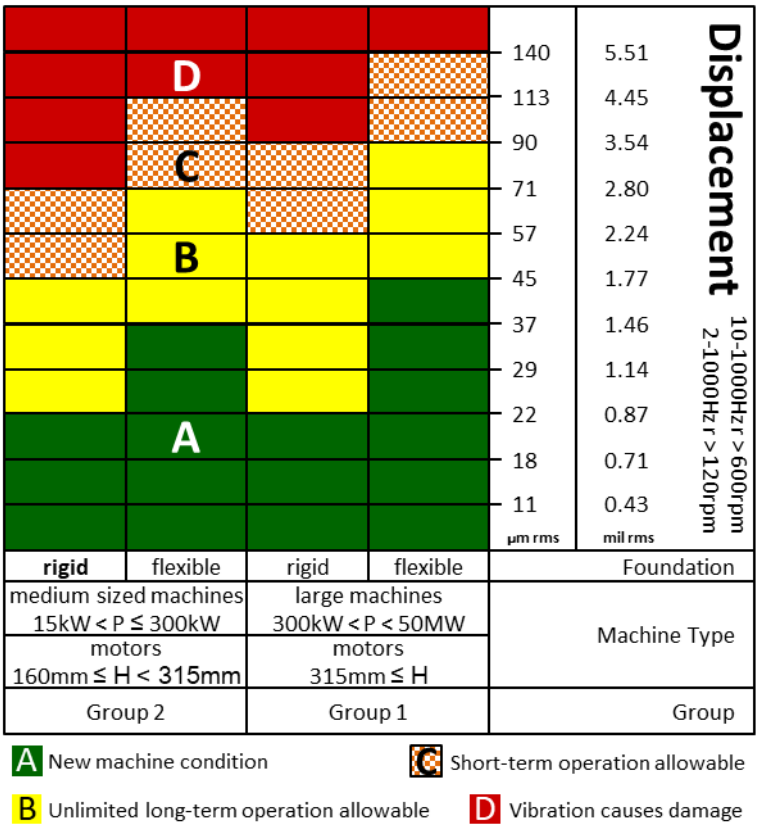
ISO 10816-3 Vibration Severity Chart（ISO 10816-3 振动量表）

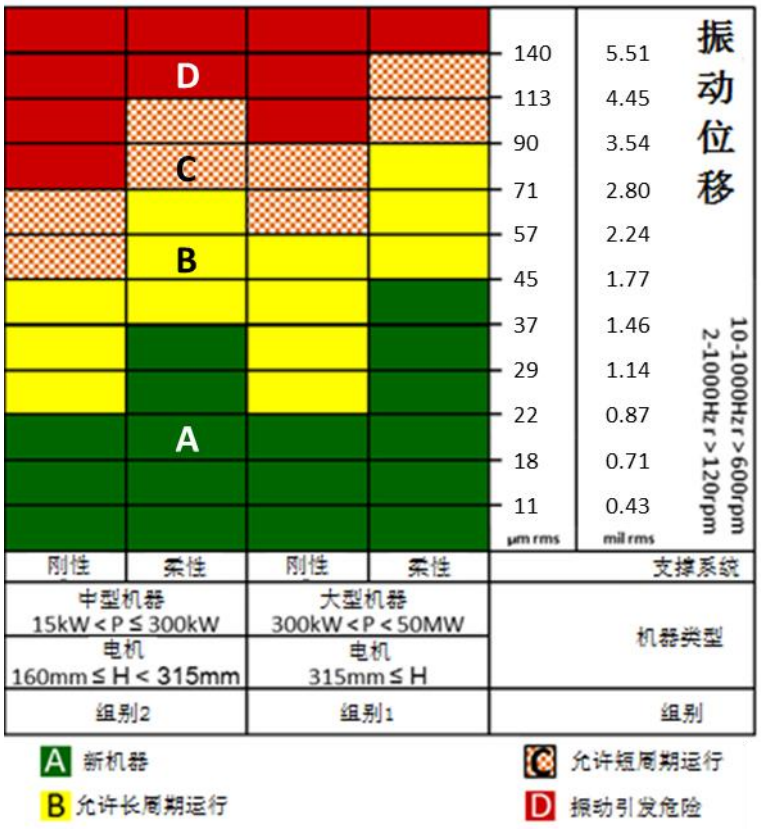




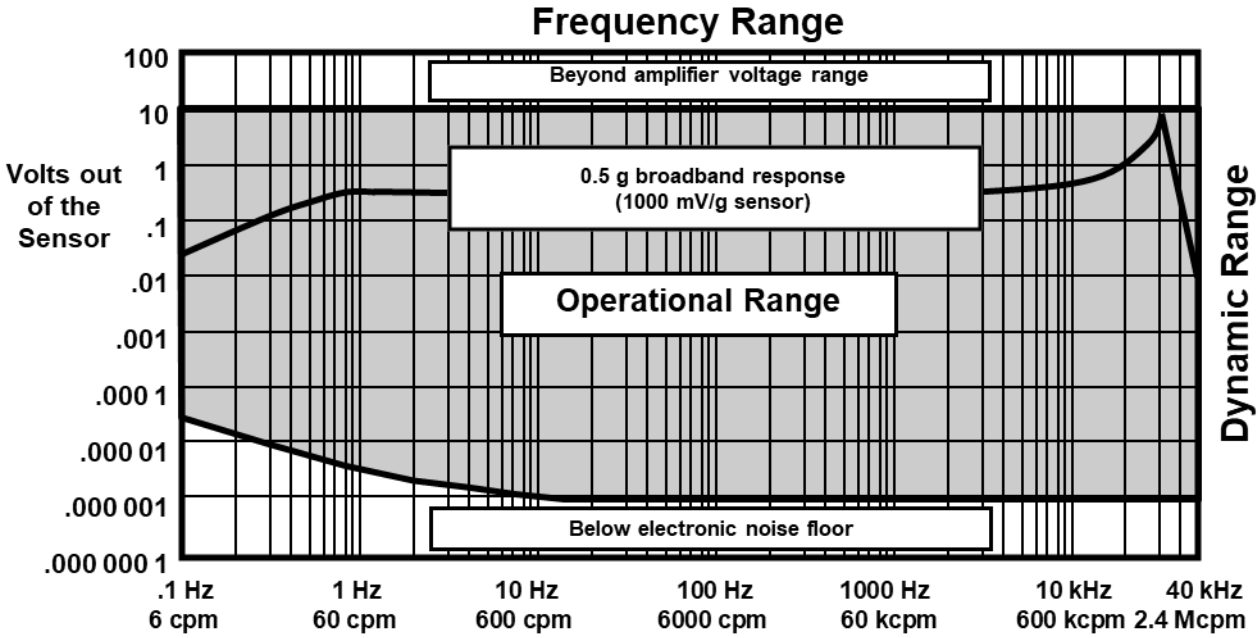
If the lowest natural frequency of the combined machine and support system in the direction of measurement is higher than its main excitation frequency (this is in most cases the rotational frequency) by at least 25 %, then the support system may be considered rigid in that direction. All other support systems may be considered flexible.

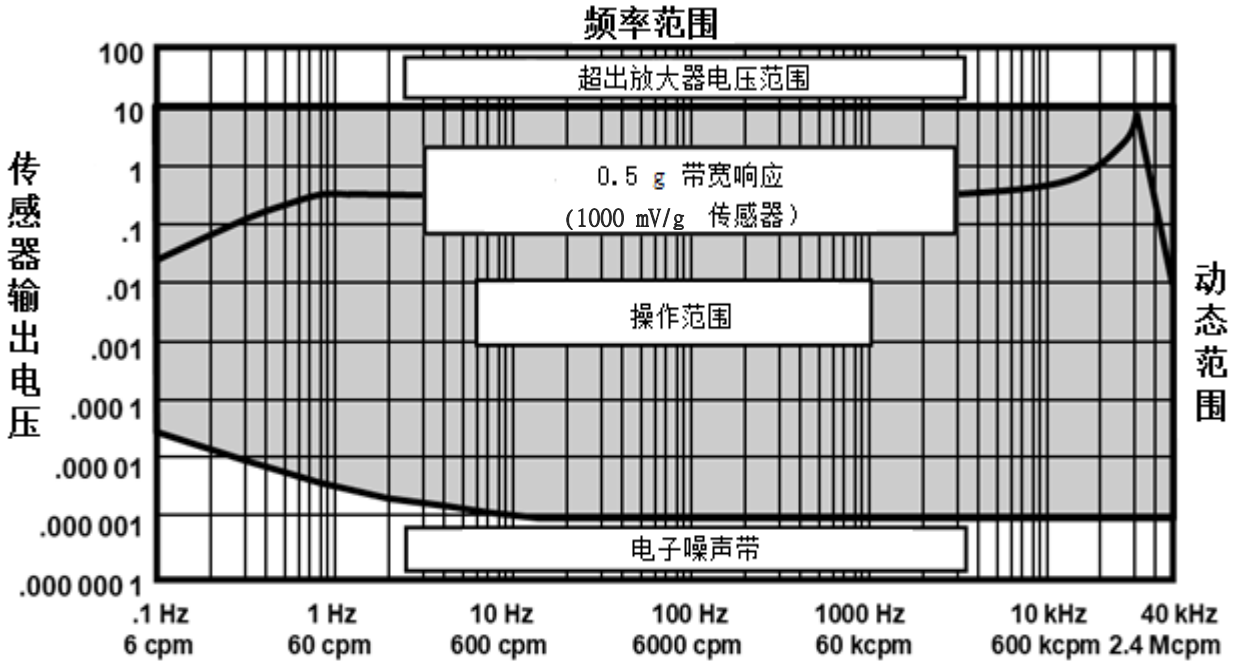
ISO 10816-3 Vibration Severity Chart（ISO 10816-3 振动量表）



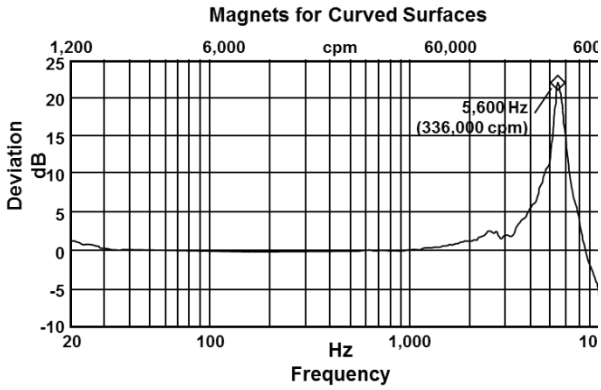


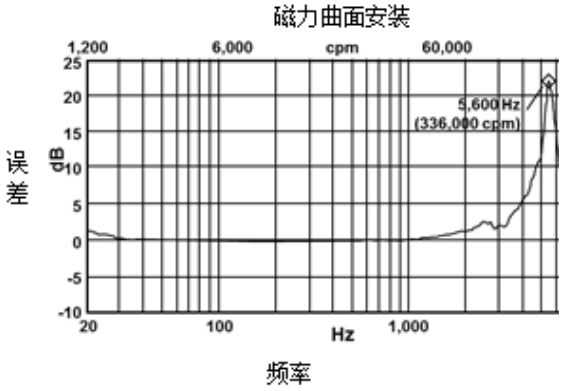
Transducer Operating Regions（传感器运行区域）



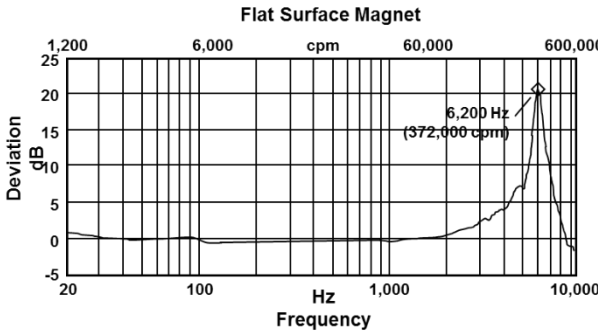


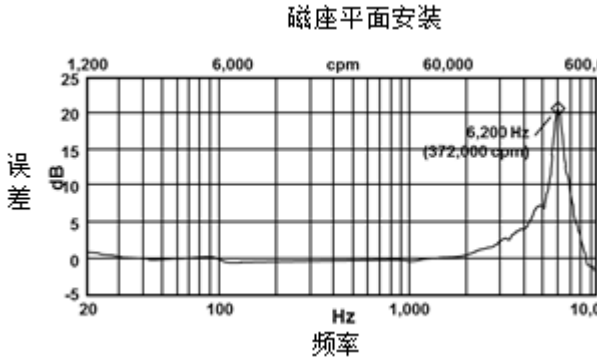
Transducer Frequency Response - Magnets on Curved Surfaces
传感器频率响应-磁座曲面安装



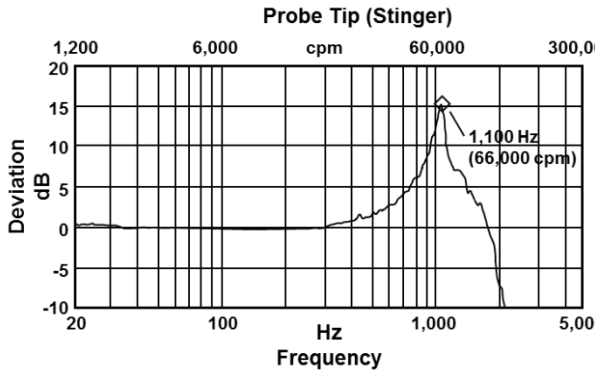


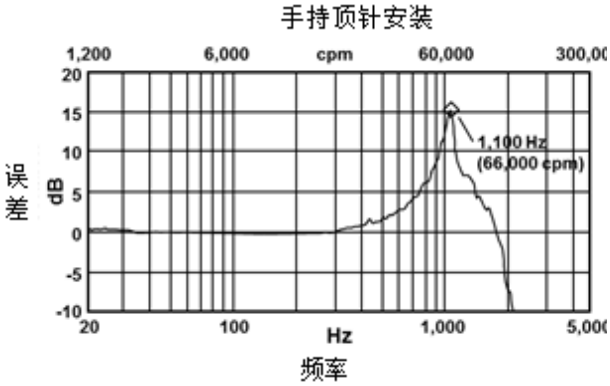
Transducer Frequency Response - Magnets on Flat Surface
传感器频率响应-磁座平面安装



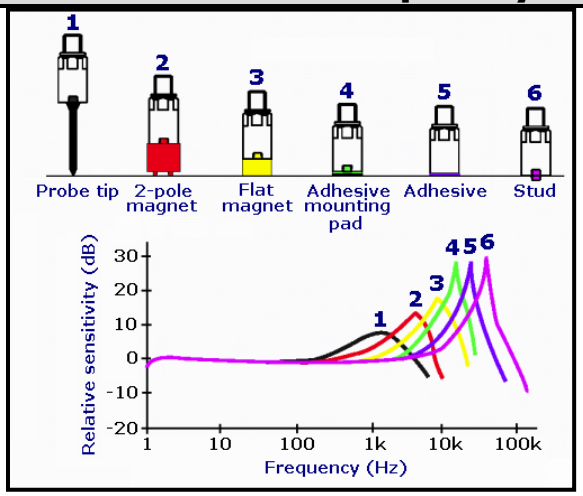


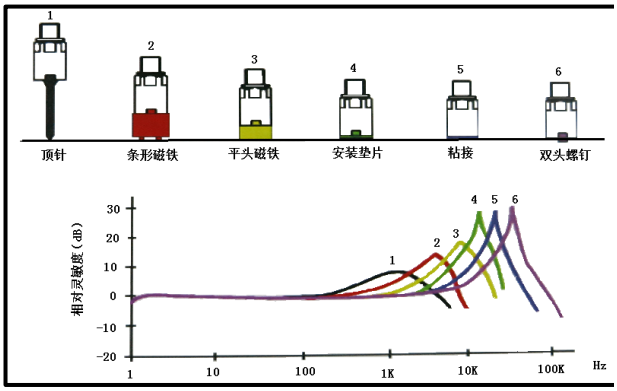
Transducer Frequency Response - Stingers or Hand Held Probes 传感器频率响应-手持顶针安装



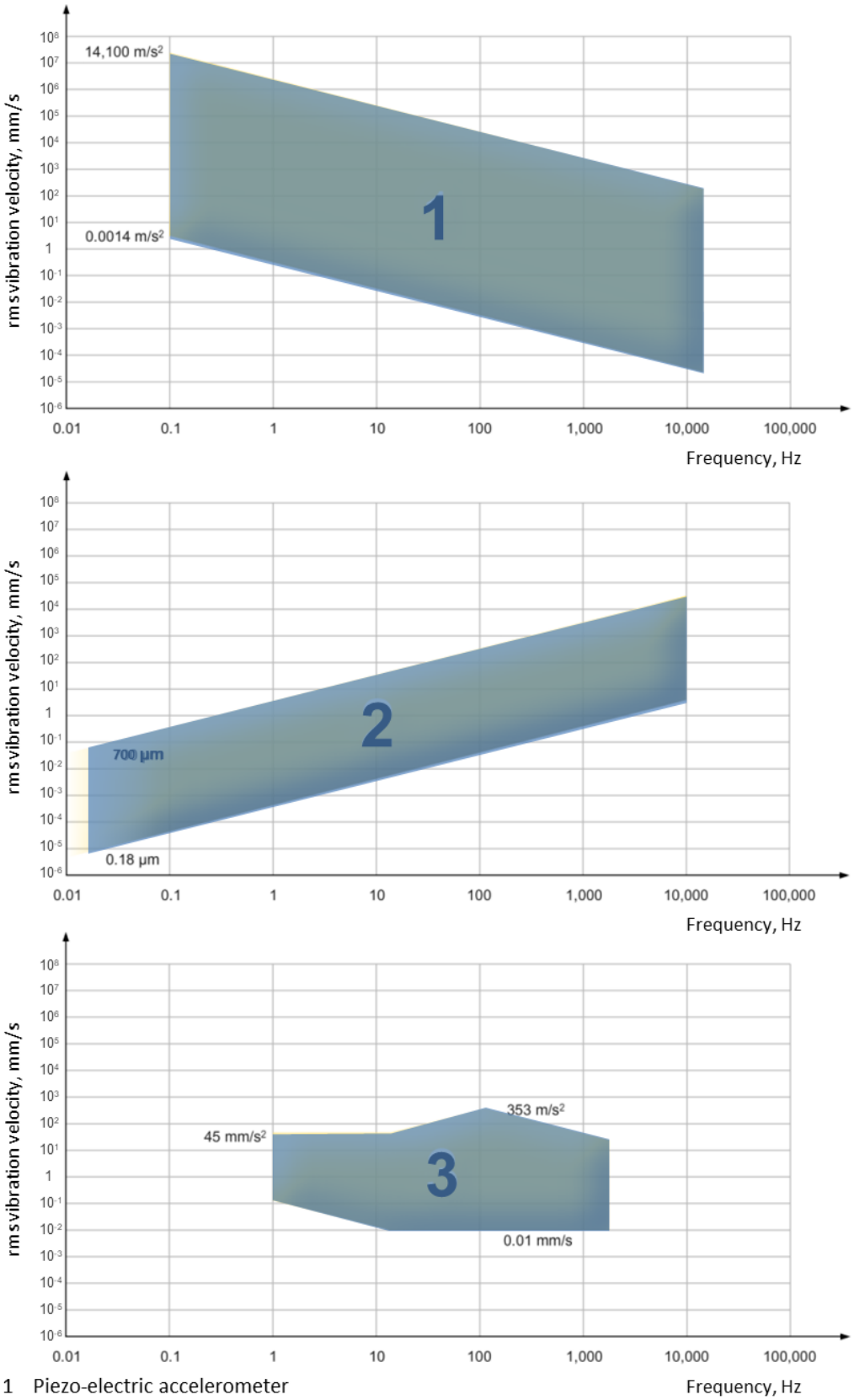


Transducer Frequency Response Curves 传感器频率响应曲线



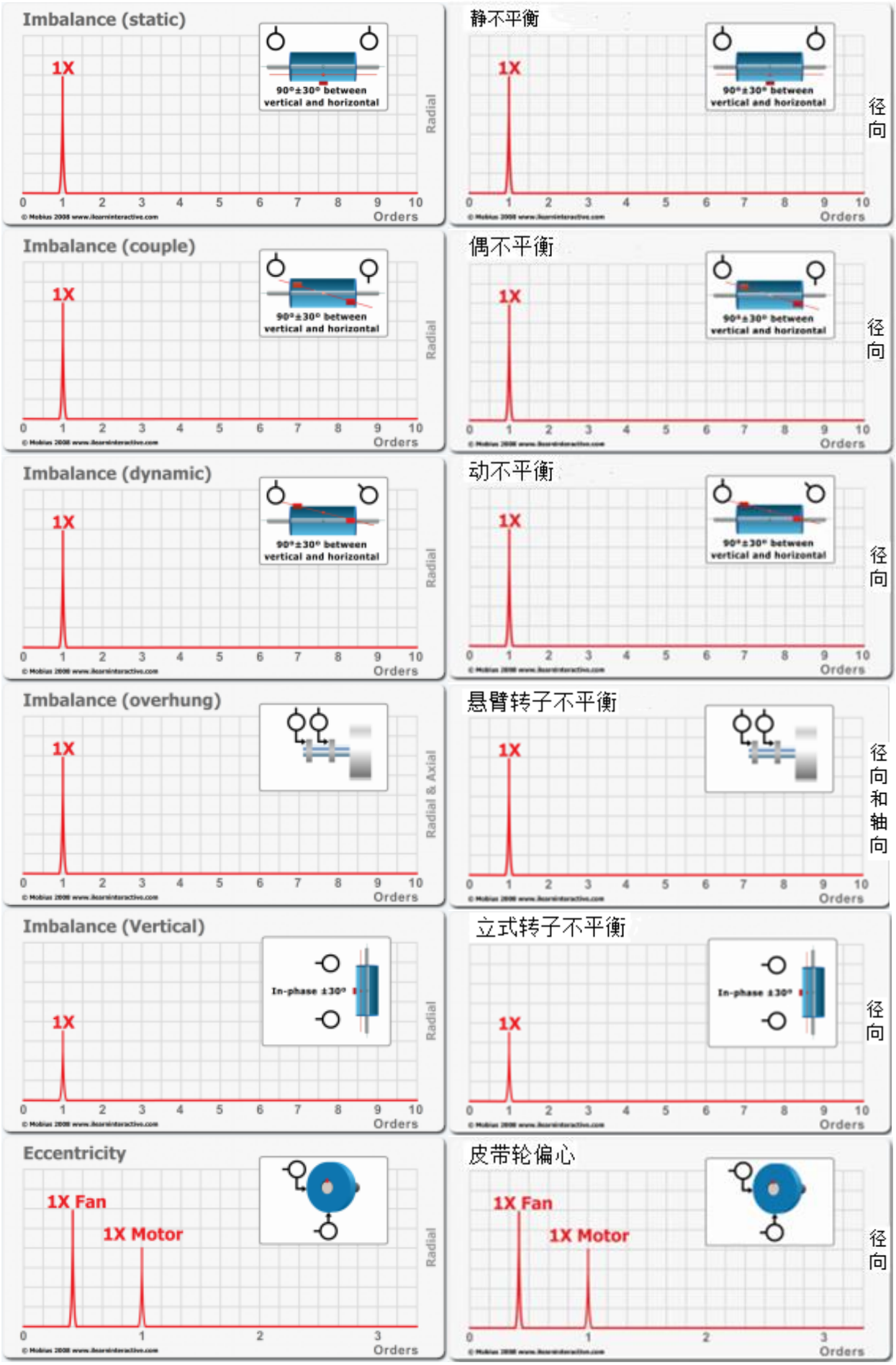


Transducer Effectiveness Regions 传感器有效区域

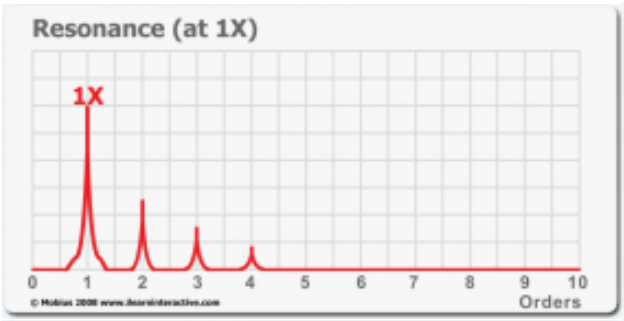


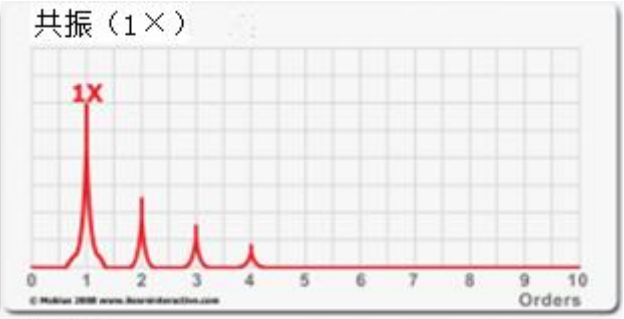
1 Piezo-electric accelerometer
2 Eddy-current proximity probe
3 Electro-mechanical velocity transducer

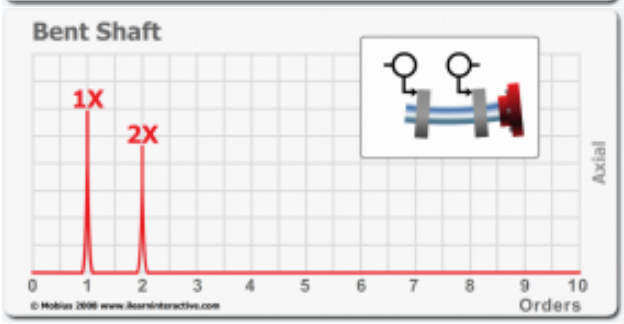
1 piezo-electric accelerometer 压电式加速度传感器
2 Eddy-current proximity probe 电涡流位移传感器
3 Electro-mechanical velocity transducer 速度传感器

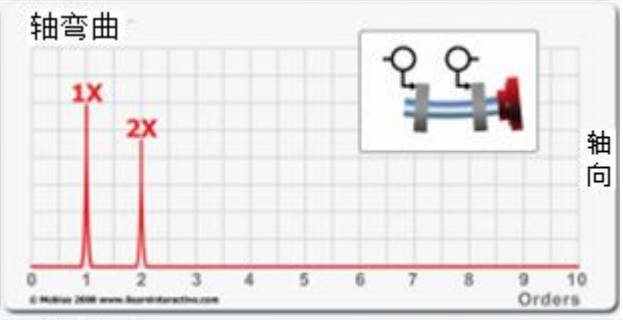


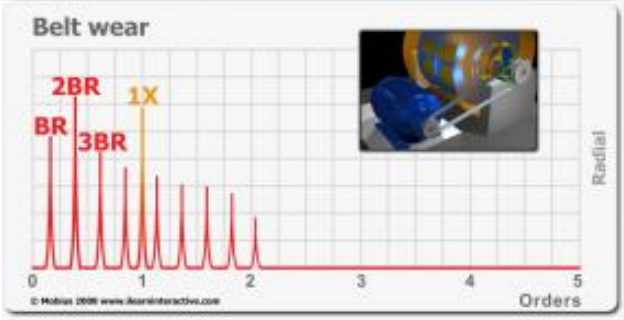
Orders 阶次

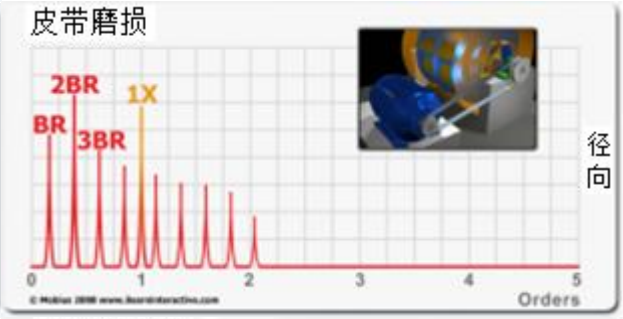


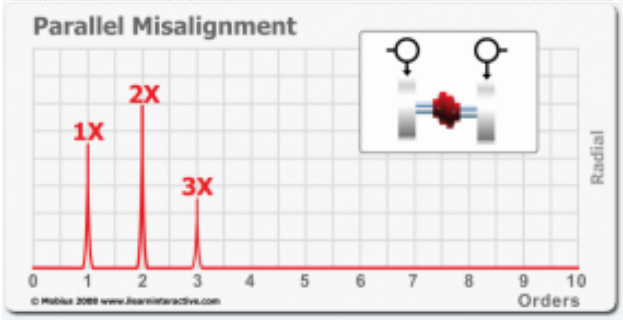


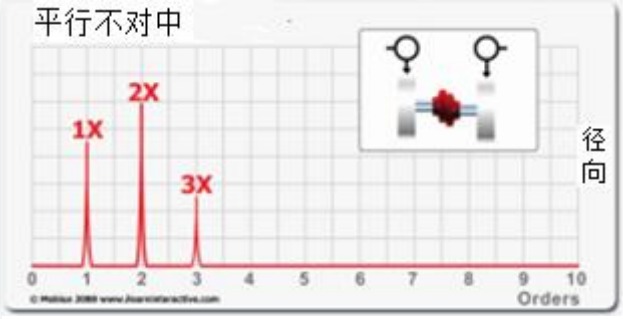


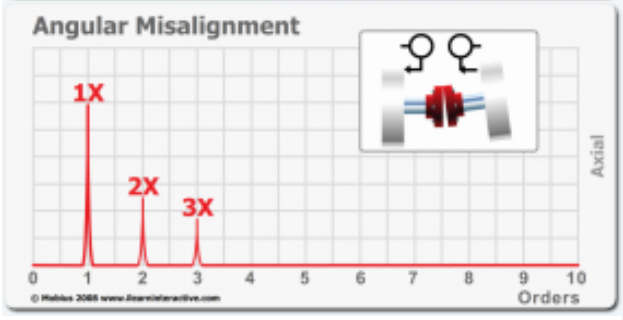


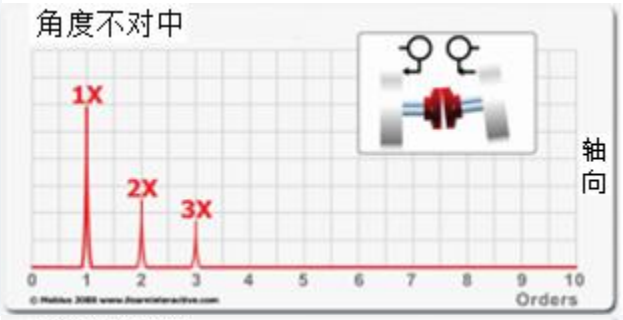


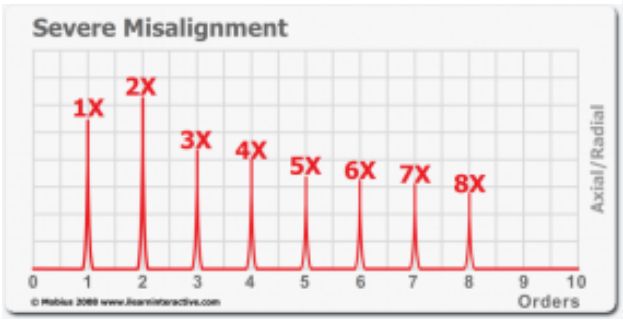


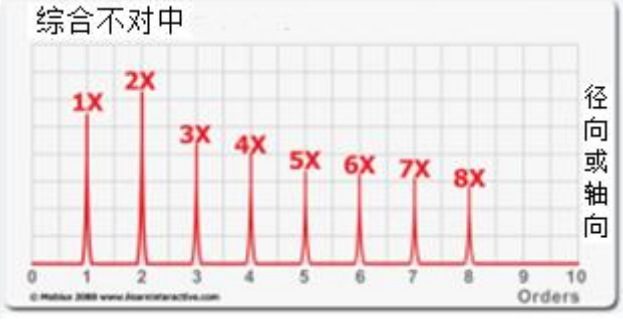


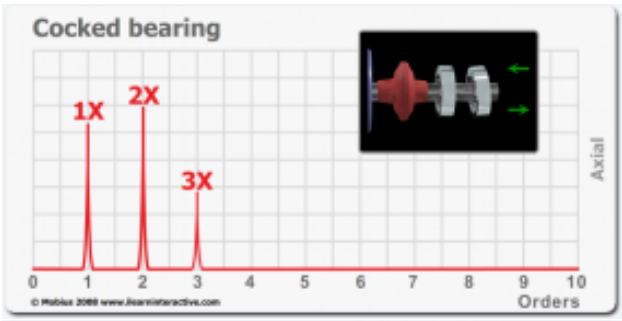


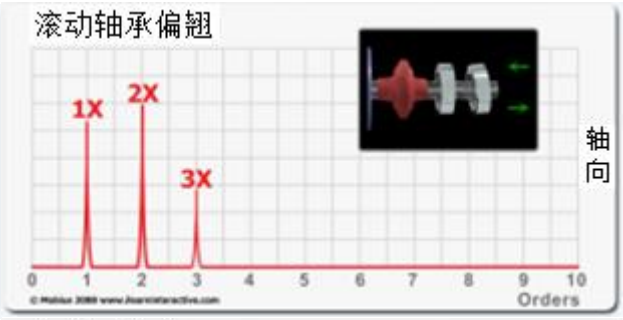


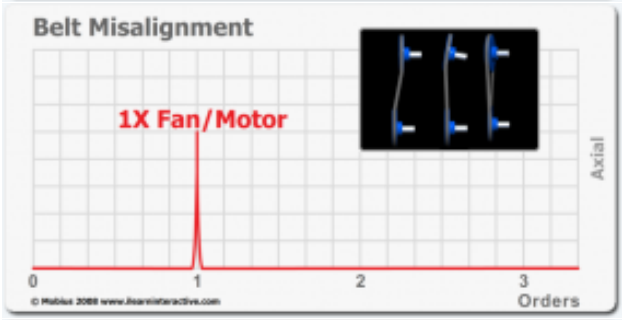


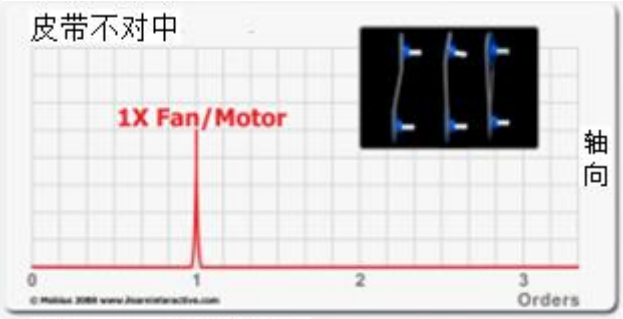


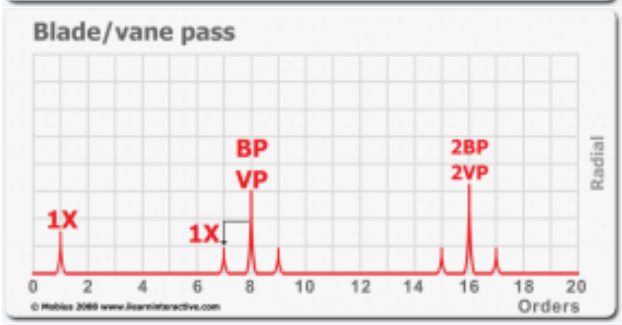


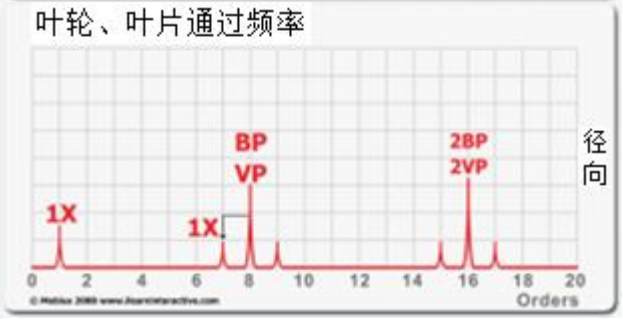


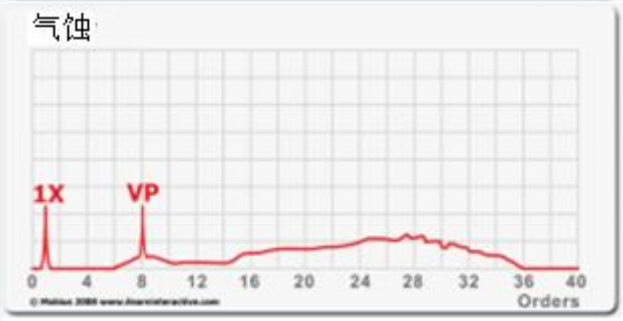


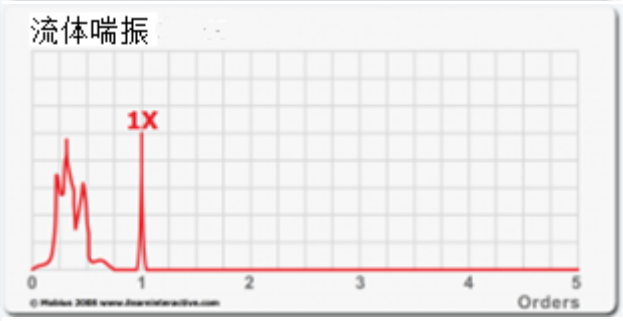


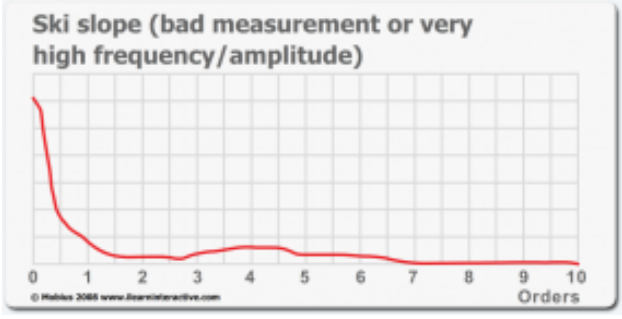


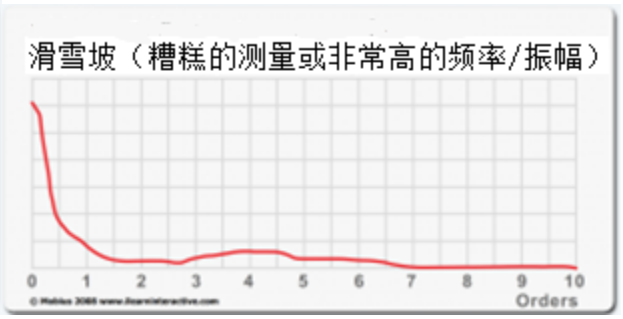


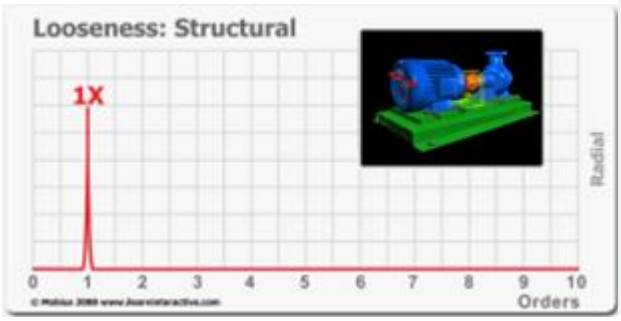


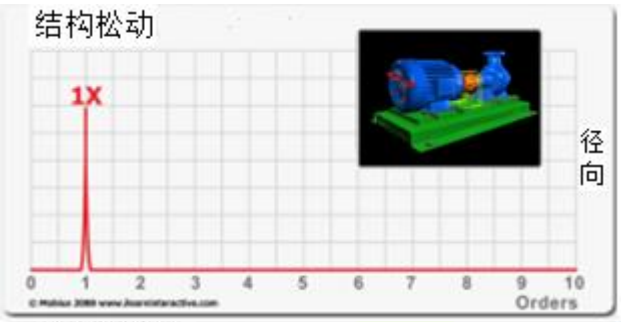


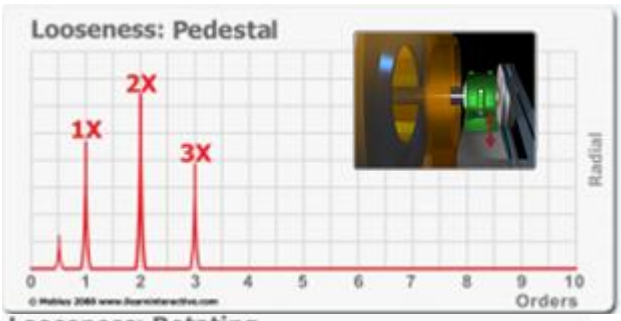


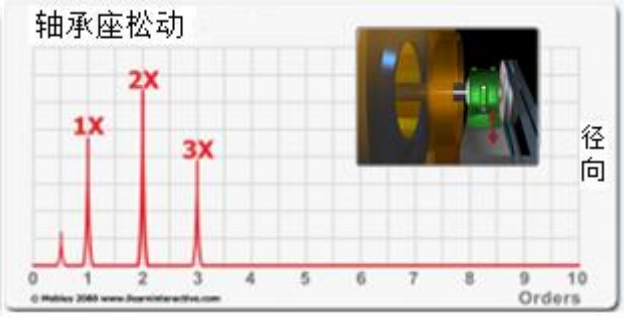


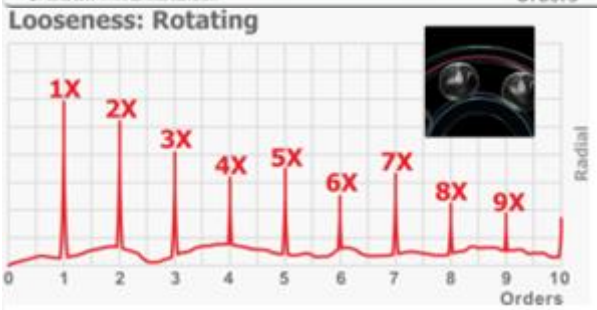


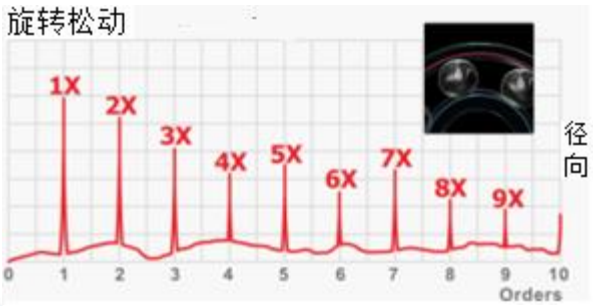


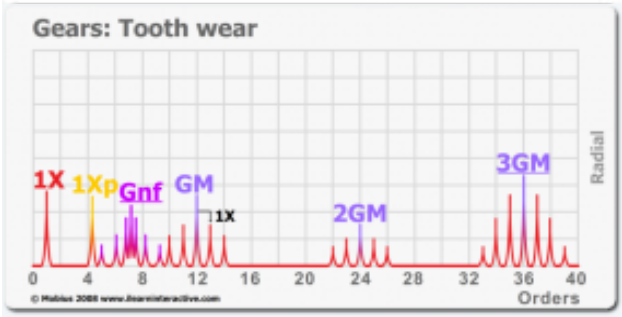


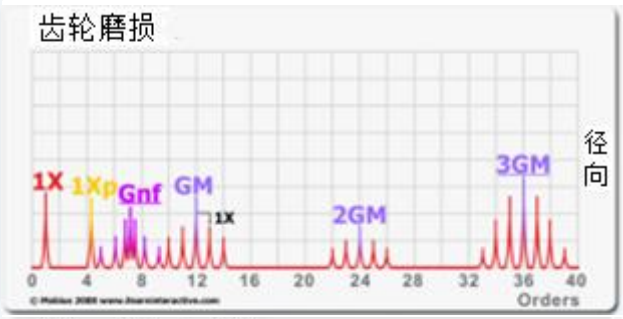


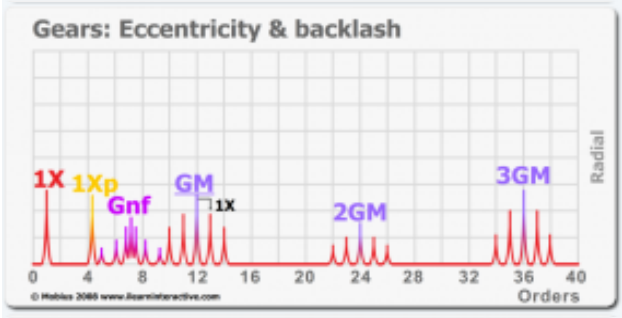


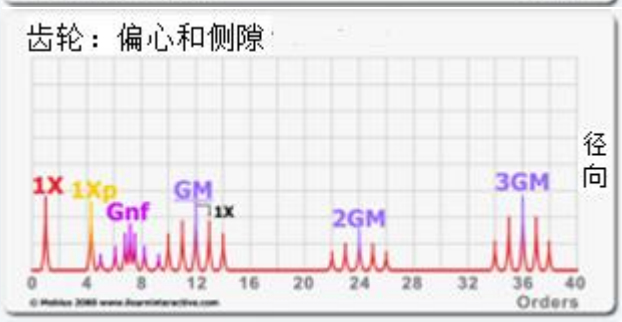


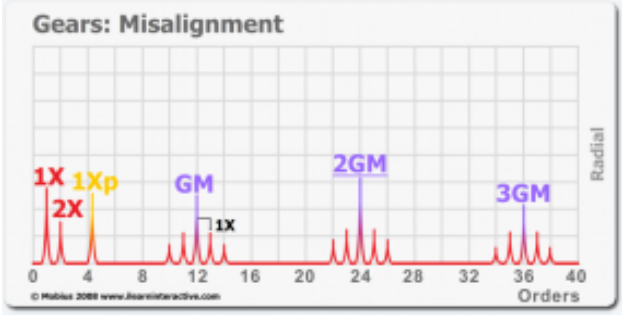


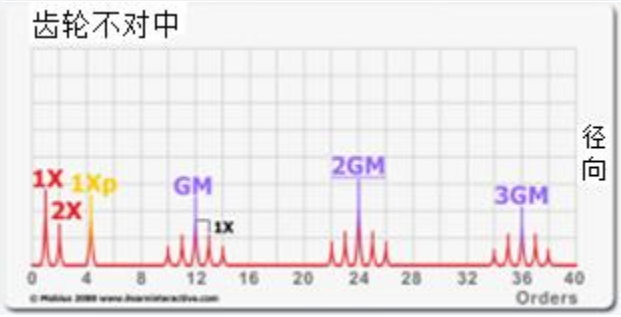


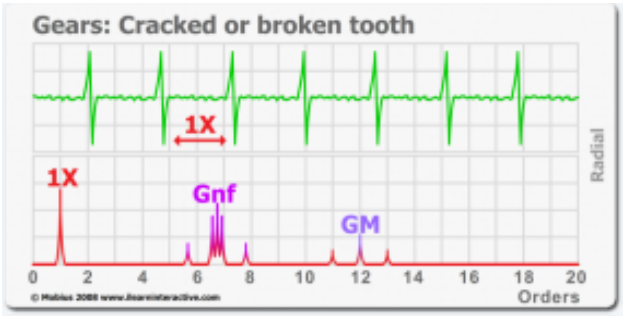


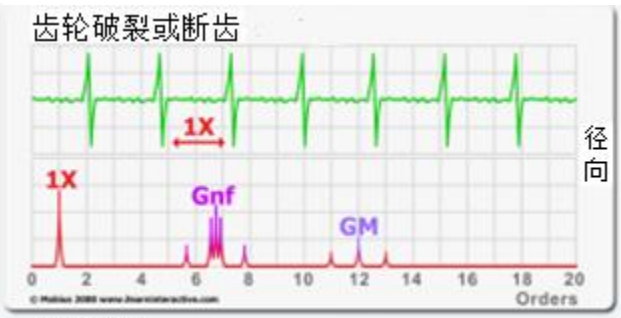


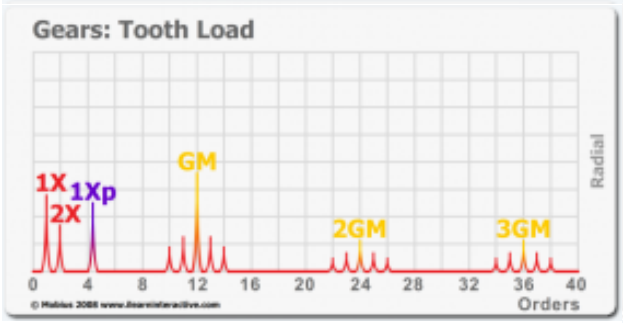


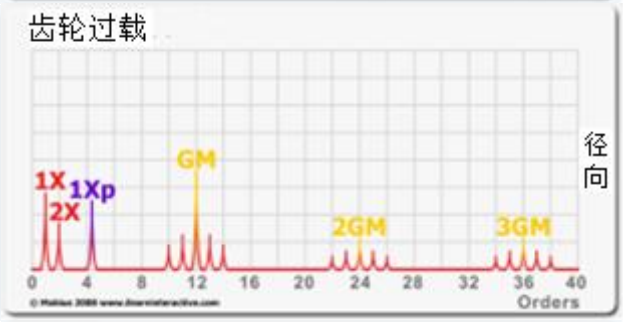


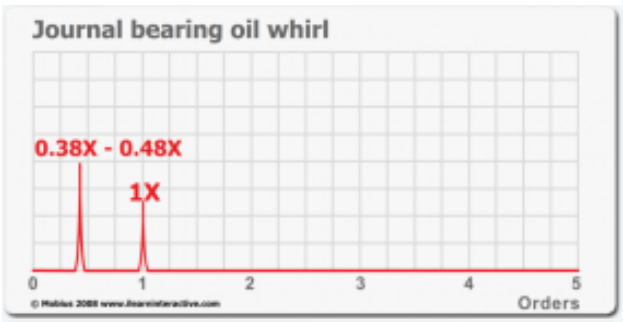


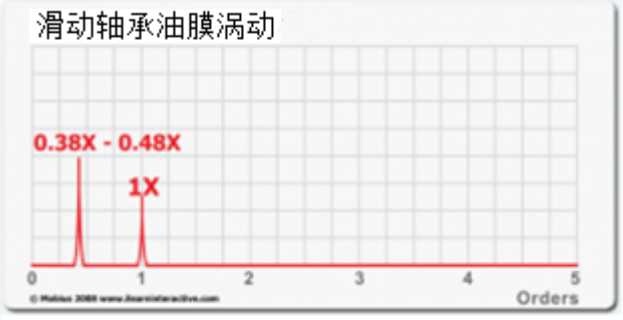


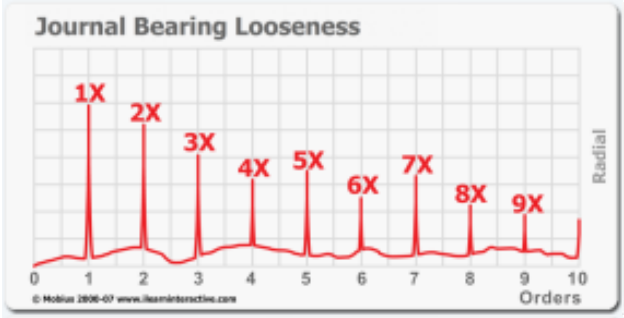


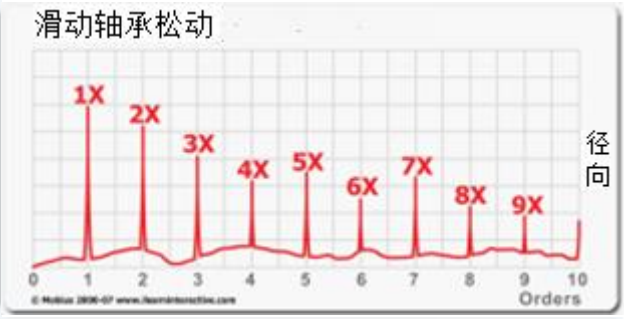


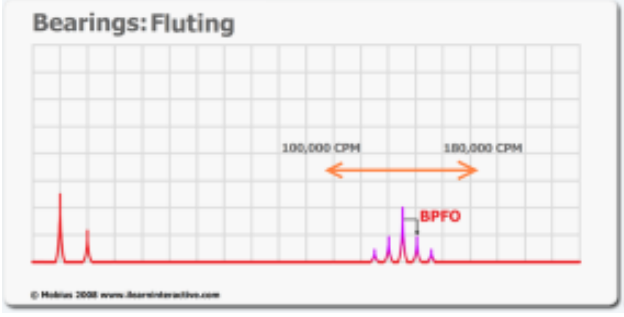


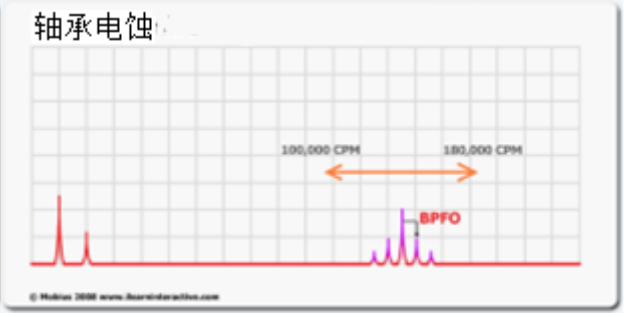


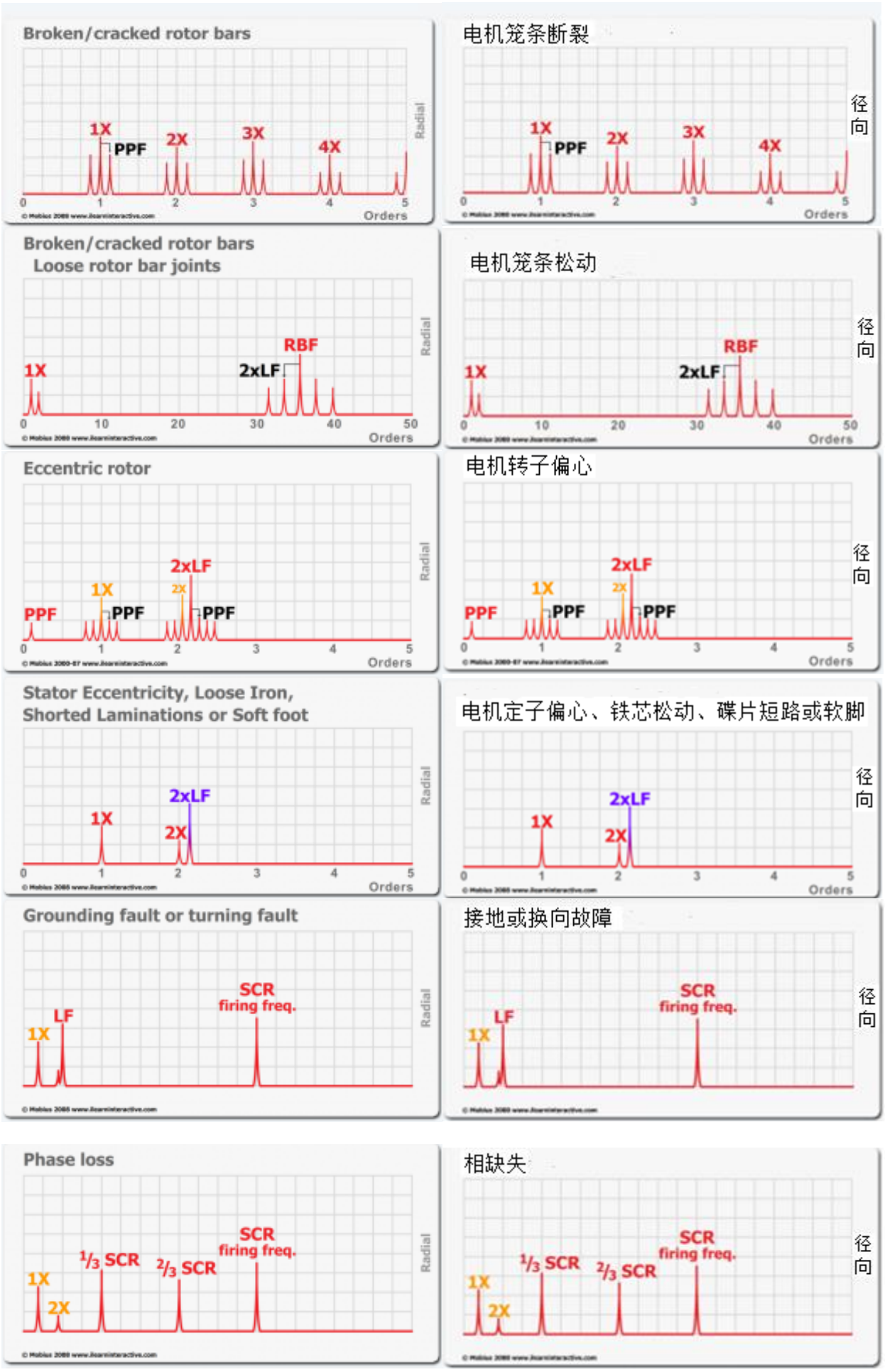


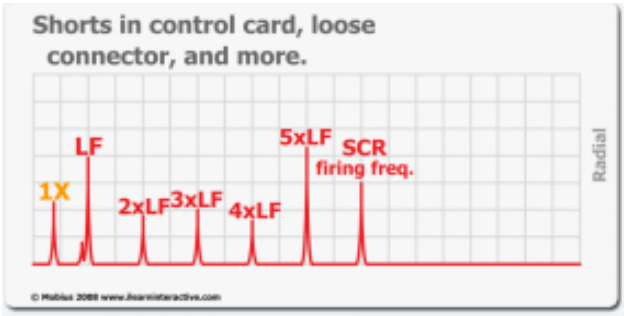


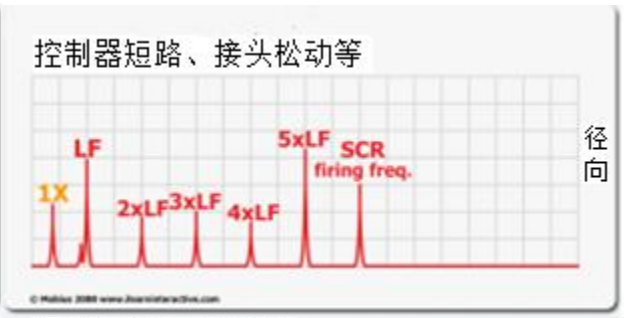


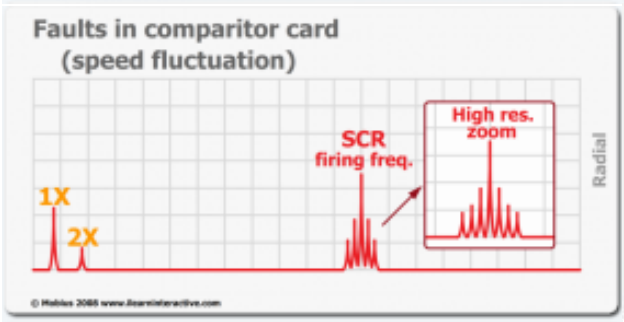


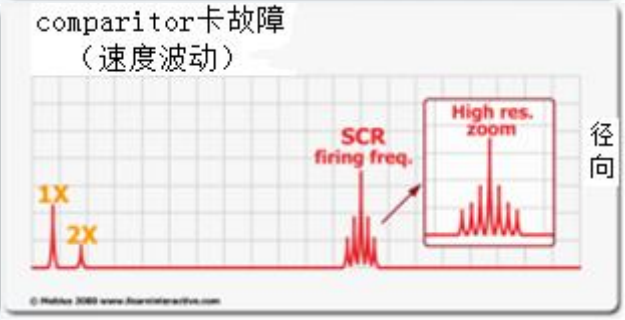


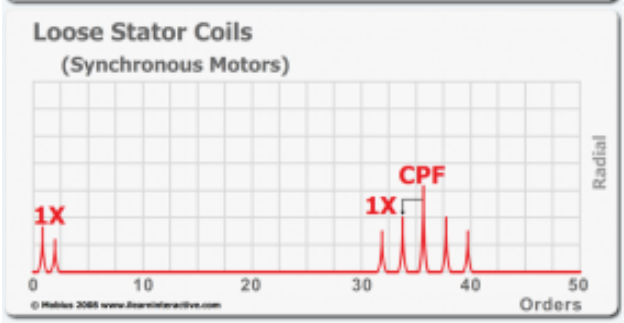


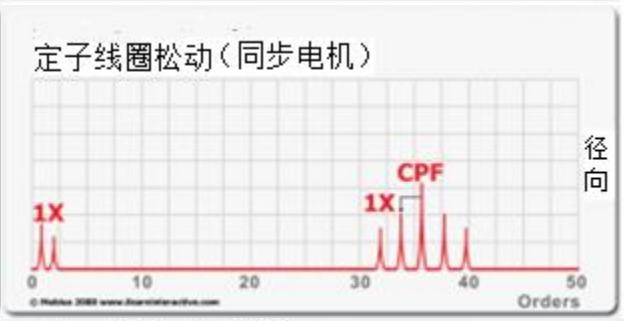


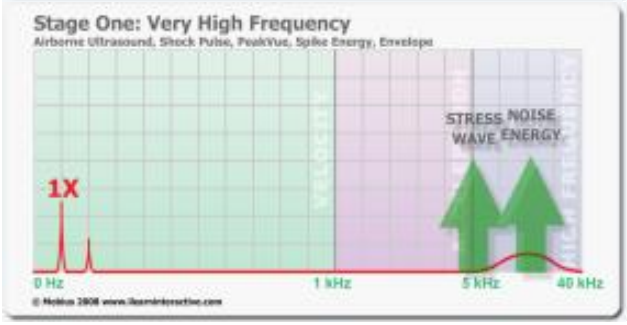


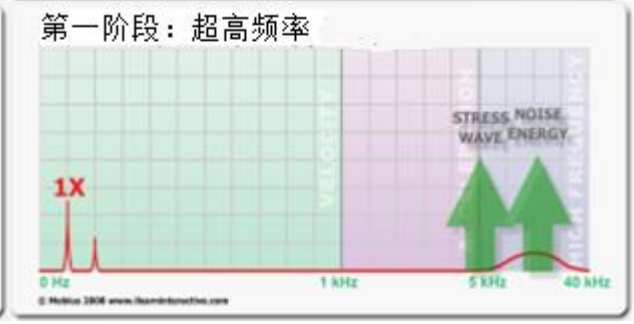






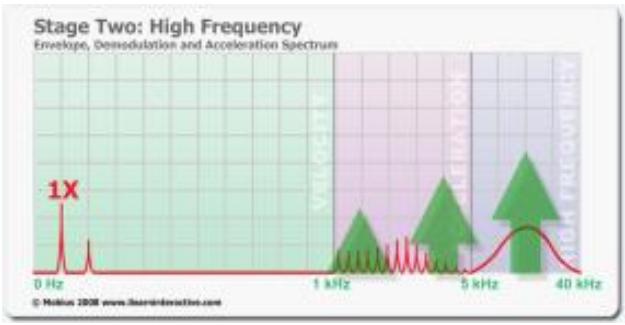


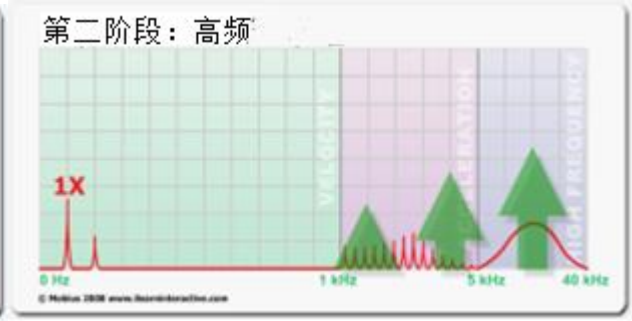




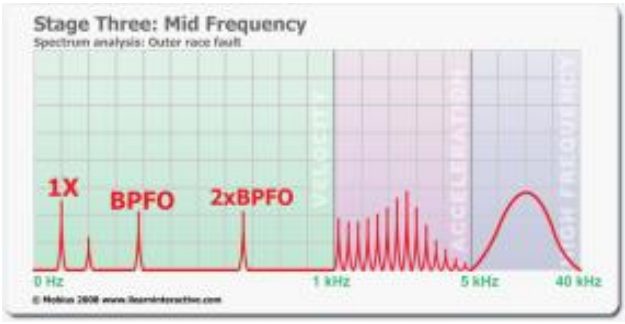
Stage One: Airborne Ultrasound, Shock Pulse, PeakVue, Spike Energy, Envelope

第一阶段：声发射、冲击脉冲、峰值、尖峰能量、包络（**stress wave：应力波**）

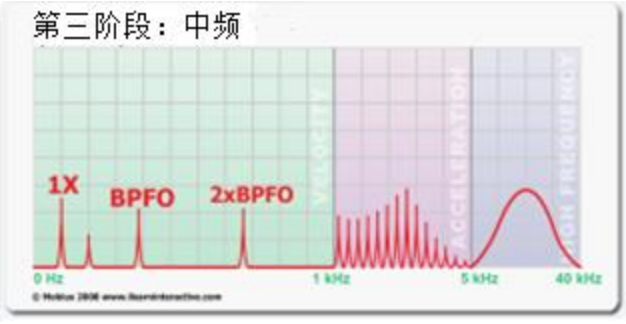




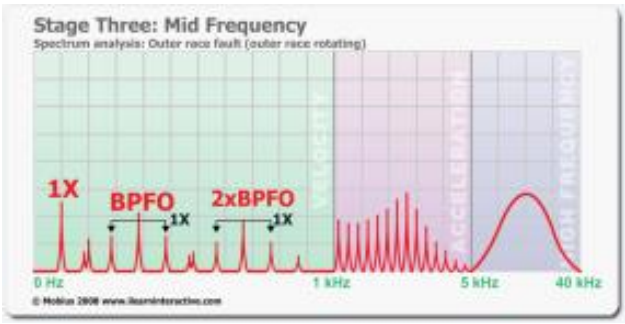
Stage Two: Envelope, Demodulation and Acceleration Spectrum 第二阶段：包络、解调和加速度频谱



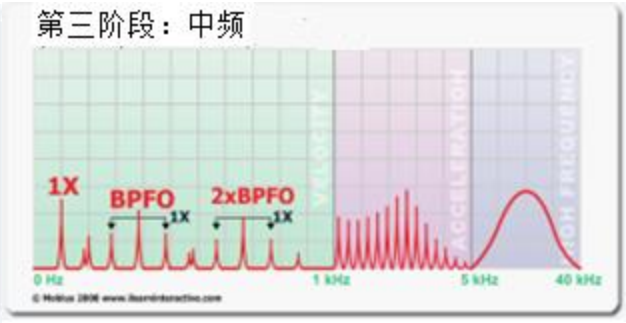
Stage Three: Outer race fault (inner race rotating)



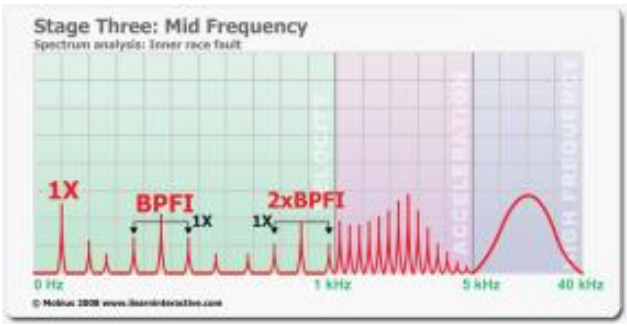
第三阶段：外圈故障（内圈旋转）



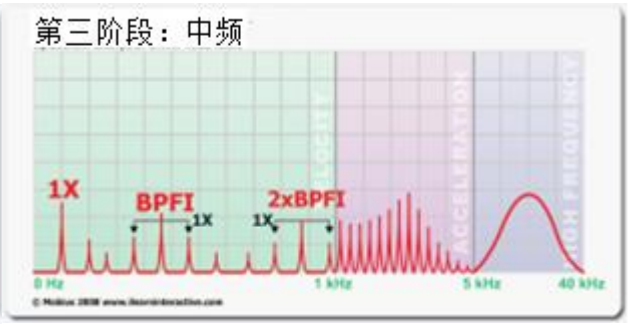
Stage Three: Outer race fault (outer race rotating)



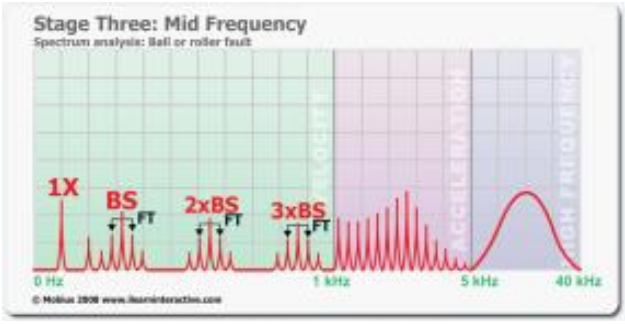
第三阶段：外圈故障（外圈旋转）



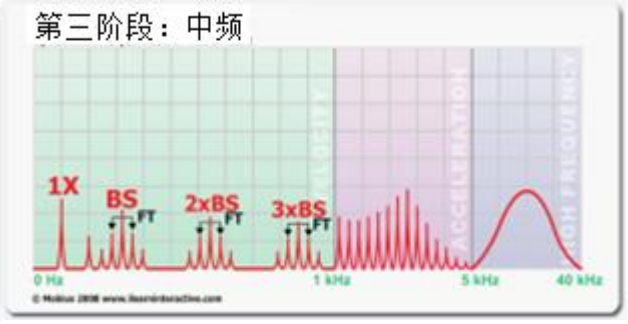
Stage Three: Inner race fault (inner race rotating)



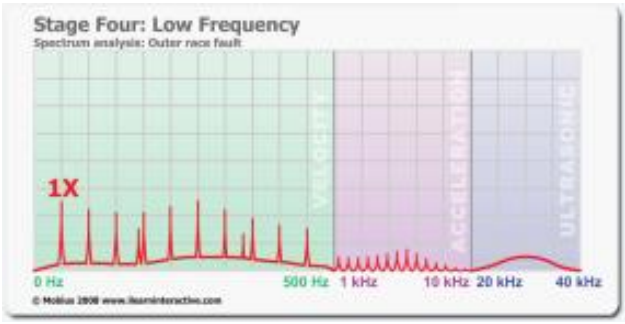
第三阶段：内圈故障（内圈旋转）



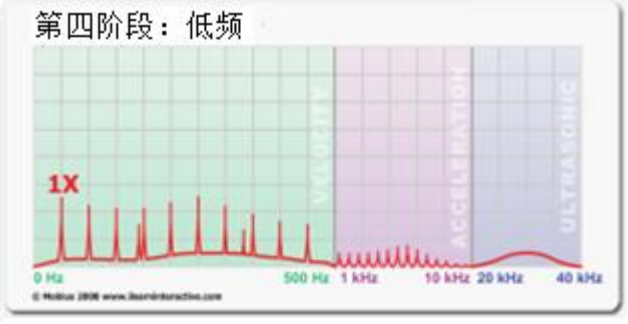
Stage Three: Ball or roller fault (inner race rotating)



第三阶段：滚动体故障（内圈旋转）



Stage Four



第四阶段：转子工频及谐波和底部噪声

Comparator Card：This card contains two limit comparators with one inverting and one non-inverting logic output, plus an output relay with a change-over contact