

The Condition Monitor & Recorder of High Speed Spindle

High Quality Products

高速主軸振動監測器

02/28/2008

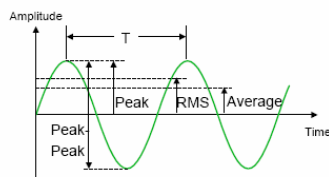
Goldstar

衡全科密有限公司
HENG QUAN PRECISION CO.,LTD



振動訊號的基本概念

** The definition of RMS and Peak



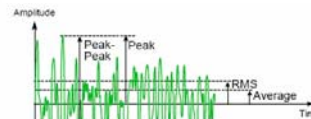
$$\text{RMS} = \sqrt{\frac{1}{T} \int_0^T x^2(t) dt}$$

$$\text{Average} = \frac{1}{T} \int_0^T |x(t)| dt$$

$$\text{Crest Factor} = \frac{\text{Peak}}{\text{RMS}}$$

$$(\text{Peak-Peak}) = 2 \times (\text{Peak-0})$$

$$(\text{Peak-0}) = \sqrt{2} \times \text{RMS}$$



$$\text{RMS} = \sqrt{\frac{1}{T} \int_0^T x^2(t) dt}$$

$$\text{Average} = \frac{1}{T} \int_0^T |x(t)| dt$$

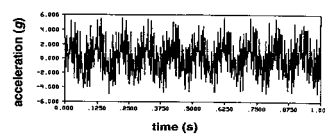
$$\text{Crest Factor} = \frac{\text{Peak}}{\text{RMS}}$$



** Detection of vibration signal

- **RMS detector:** 所量得的振動值代表某一段時間內的振動能量平均值，適用於穩定、週期性的訊號量測。
- **Peak detector:** 適用於暫態的、突波型的訊號檢測。

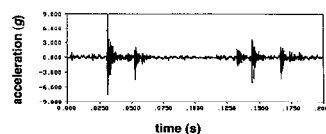
** Different detection for different applications



適用RMS Detector

Continuous Signal
typical for rotating machinery as

- Gears
- Motors
- Turbines

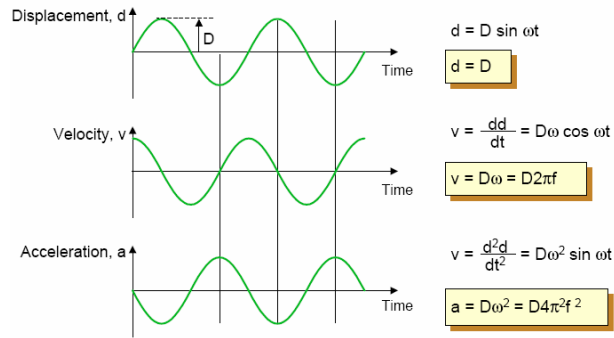


Transient Signal
impacting metal parts as

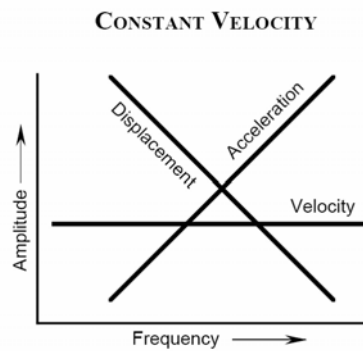
- Valve closing
- Stamping process

適用Peak Detector

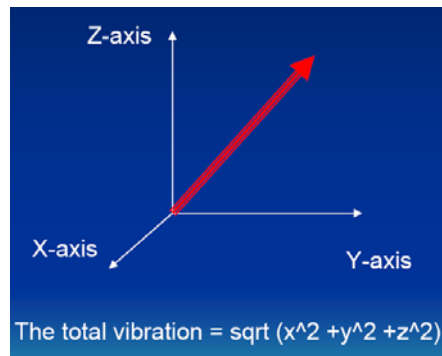
**** Three different units for vibration measurements**



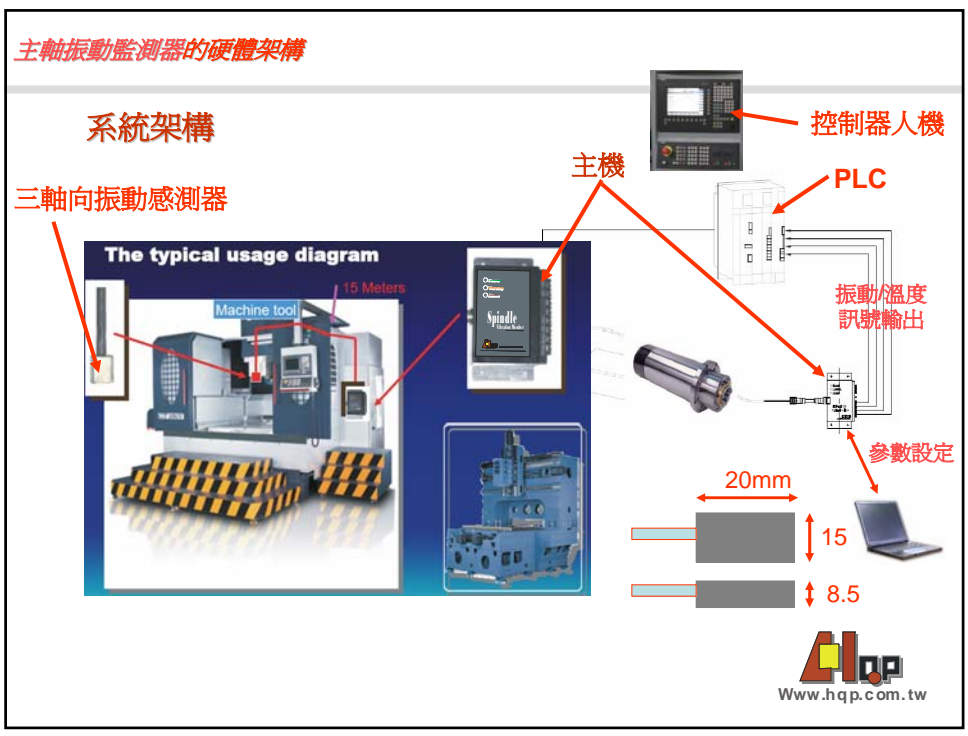
**** Three different units for vibration measurements**



**** The three axis measurement**



- ◆ 解決機台操作者不當使用CNC加工機 (銑床,車床,搪床), 而使得主軸壽命大幅縮短, 無法達到保固的時間及無預警主軸損壞的問題
- ◆ 記錄機台操作者的不當使用情形, 如主軸撞車, 進刀量過大, 造成主軸損壞, 以便責任釐清
- ◆ 即時輸出主軸振動訊號通知操作者使用加工條件是否適當, 讓高速主軸在一個合理的切削條件下運作, 以提高主軸壽命與維持切削精度
- ◆ 可隨時偵測主軸的運轉狀況是否異常, 如CNC車床工件夾持是否適當, 造成震刀等現象
- ◆ 內建溫度Sensor可監控主軸軸承溫升
- ◆ 機台出機前主軸振動量測
- ◆ 智慧型工具機的應用



主軸振動監測器的硬體架構

硬體架構




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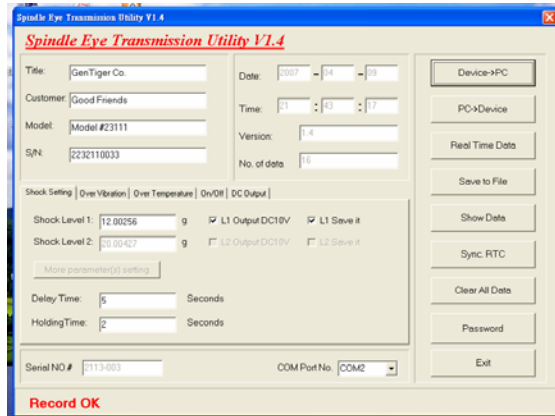
主軸振動監測器的主要規格

詳細規格	說明	詳細規格	說明
外觀尺寸	105 x 70 x 45 (mm)	指示燈	Green, Orange, Red
重量	200.0 gram	撞擊觸發準位	Programmable
電源	DC18V - DC36V	撞擊觸發延遲	Programmable
消耗功率	< 2.0W	時鐘設定	Sync. with PC
撞擊測量範圍	20.0 g (true-peak)	最大筆數	12,000
振動測量範圍	150.0 mm/s (rms)	過長紀錄	Circle Buffer
頻率響應	10Hz - 1KHz (ISO2954)	ID 識別	Programmable
內建記憶體	EEPROM	加速規	500mV/g
傳輸介面	RS232 (38,400 bps)	溫度測量範圍	-10°C - 125°C
環境溫度	5°C - 85°C	加速規與主機	>15 meter
相對濕度	25% - 80%	輸出感度 (Vo)	Programmable
資料擷取速度	30KHz(max.)	溫度 Vout	DC 0V - 10V (20mA)
最大測量方向	三軸向 (X, Y, Z axis)	振動 Vout	DC 0V - 10V (20mA)


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主軸振動監測器的軟體介面

參數設定

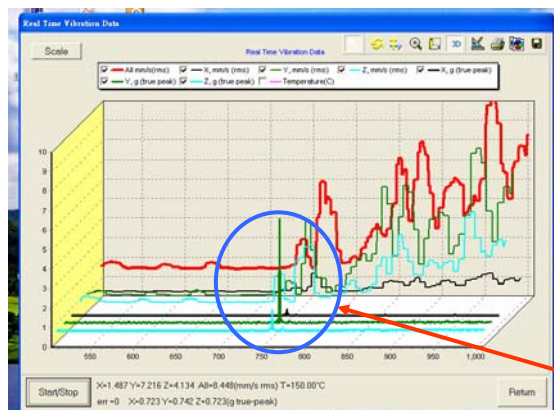


- 1.撞機值設定
- 2.振動過大值設定
- 3.溫度過高值設定
- 4.開關機運轉值設定
5. DC 0-10V 輸出準位設定



主軸振動監測器的軟體介面

**3D即時顯示振動值

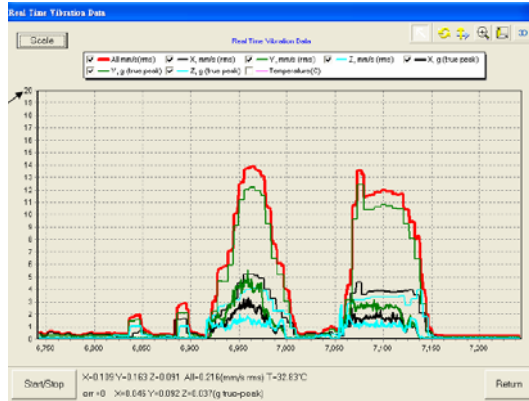


撞擊訊號



主軸振動監測器的軟體介面

****2D即時顯示振動值**



主軸振動監測器的軟體介面

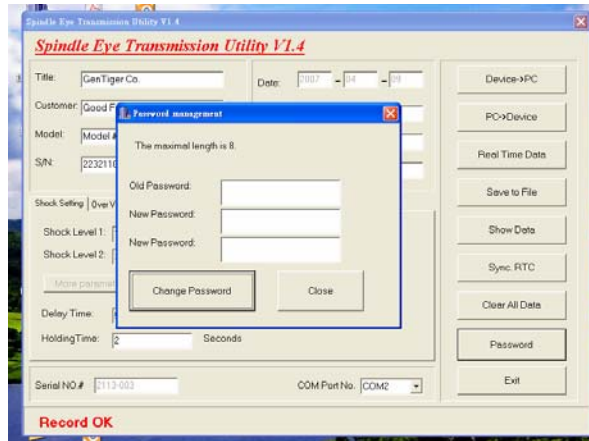
****主軸運轉紀錄**

Recorded Vibration Data			
	Event Name	Date & Time	Value
1	Event Name	Date & Time	Value
2	Vibration Over	2007/02/12 09:03:21	V=8.97 mm/s
3	Spindle ON	2007/02/13 09:21:12	V=3.12 mm/s
4	Spindle OFF	2007/02/13 09:47:00	T=31.7 °C
5	Shock	2007/02/14 14:13:18	12.71 g (true-peak)
6	Shock	2007/02/14 14:35:11	16.33 g (true-peak)
7	Vibration Over	2007/02/14 15:31:01	V=9.31 mm/s
8	Shock	2007/02/14 15:11:51	11.21 g (true-peak)
9	Spindle ON	2007/02/15 09:11:59	V=2.31 mm/s
10	Shock	2007/02/15 10:13:11	15.54 g (true-peak)
11	Vibration Over	2007/02/15 14:44:58	V=9.65 mm/s
12	Spindle OFF	2007/02/15 15:12:11	T=35.1 °C
13	Spindle ON	2007/02/16 10:31:29	V=4.32 mm/s
14	Vibration Over	2007/02/16 11:53:19	V=9.88 mm/s
15	Vibration Over	2007/02/16 14:13:11	V=8.91 mm/s
16	Shock	2007/02/16 15:31:10	10.82 g (true-peak)
17	Vibration Over	2007/02/16 15:33:21	V=8.12 mm/s
18	Spindle OFF	2007/02/16 16:01:01	T=36.8 °C
19	Shock	2007/02/17 10:13:51	13.17 g (true-peak)
20	Shock	2007/02/17 10:42:45	15.71 g (true-peak)
21	Spindle ON	2007/02/17 10:55:55	V=8.92 mm/s
22	Shock	2007/02/17 11:03:22	10.12 g (true-peak)
23	Vibration Over	2007/02/17 15:01:42	V=9.98 mm/s
24	Spindle OFF	2007/02/17 15:03:54	T=37.5 °C
25	Shock	2007/02/18 11:54:58	15.28 g (true-peak)
26	Spindle ON	2007/02/18 13:22:29	V=9.12 mm/s
27	Vibration Over	2007/02/18 13:43:21	V=8.13 mm/s
28	Shock	2007/02/18 14:33:49	11.18 g (true-peak)
29	Shock	2007/02/18 14:48:37	13.71 g (true-peak)



主軸振動監測器的軟體介面

****密碼保護資料安全**

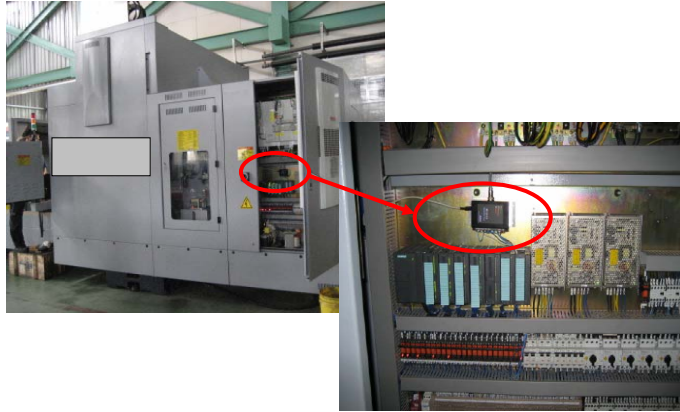


主軸振動監測器的測試實況

**** Machine Tools for testing**



主軸振動監測器的測試實況




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主軸振動監測器的測試實況

**** Configuration for Testing**




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主軸振動監測器的測試實況

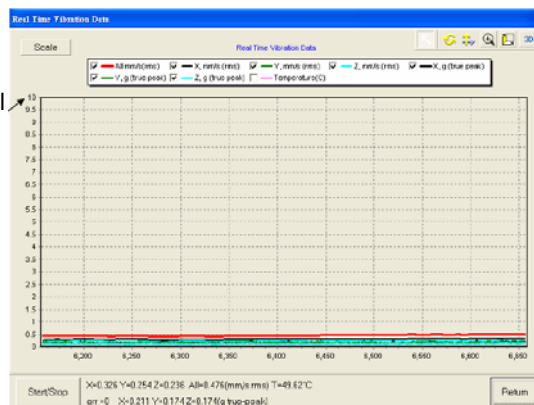
****精切 for Vibration Testing**



主軸振動監測器的測試實況

**** No loading spindle vibration**

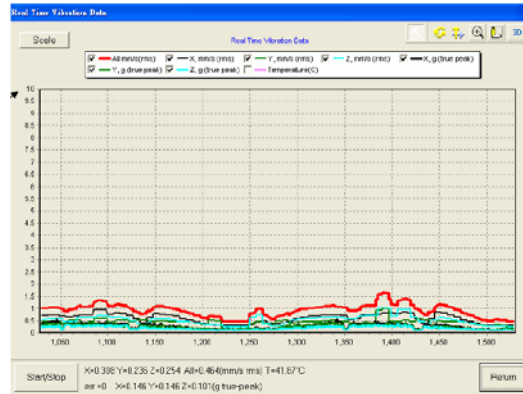
The vertical scale 10.0 mm/s(rms)



主軸振動監測器的測試實況

**** 精切 Spindle vibration**

The vertical scale 10.0 mm/s(rms)



主軸振動監測器的測試實況

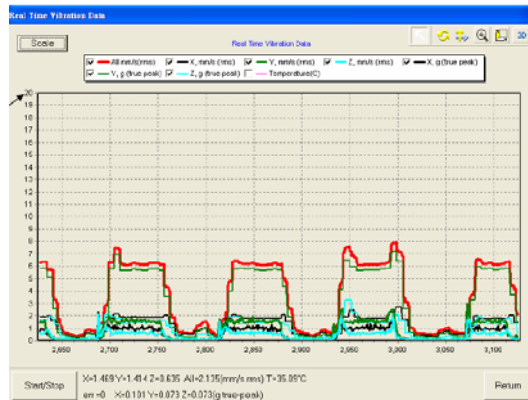
****粗切 for Vibration Testing**



主軸振動監測器的測試實況

** 粗切 Spindle Vibration

The vertical
scale 20.0
mm/s(rms)




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The condition Monitor & Recorder of High Speed Spindle

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