

平衡的要求與等級標準

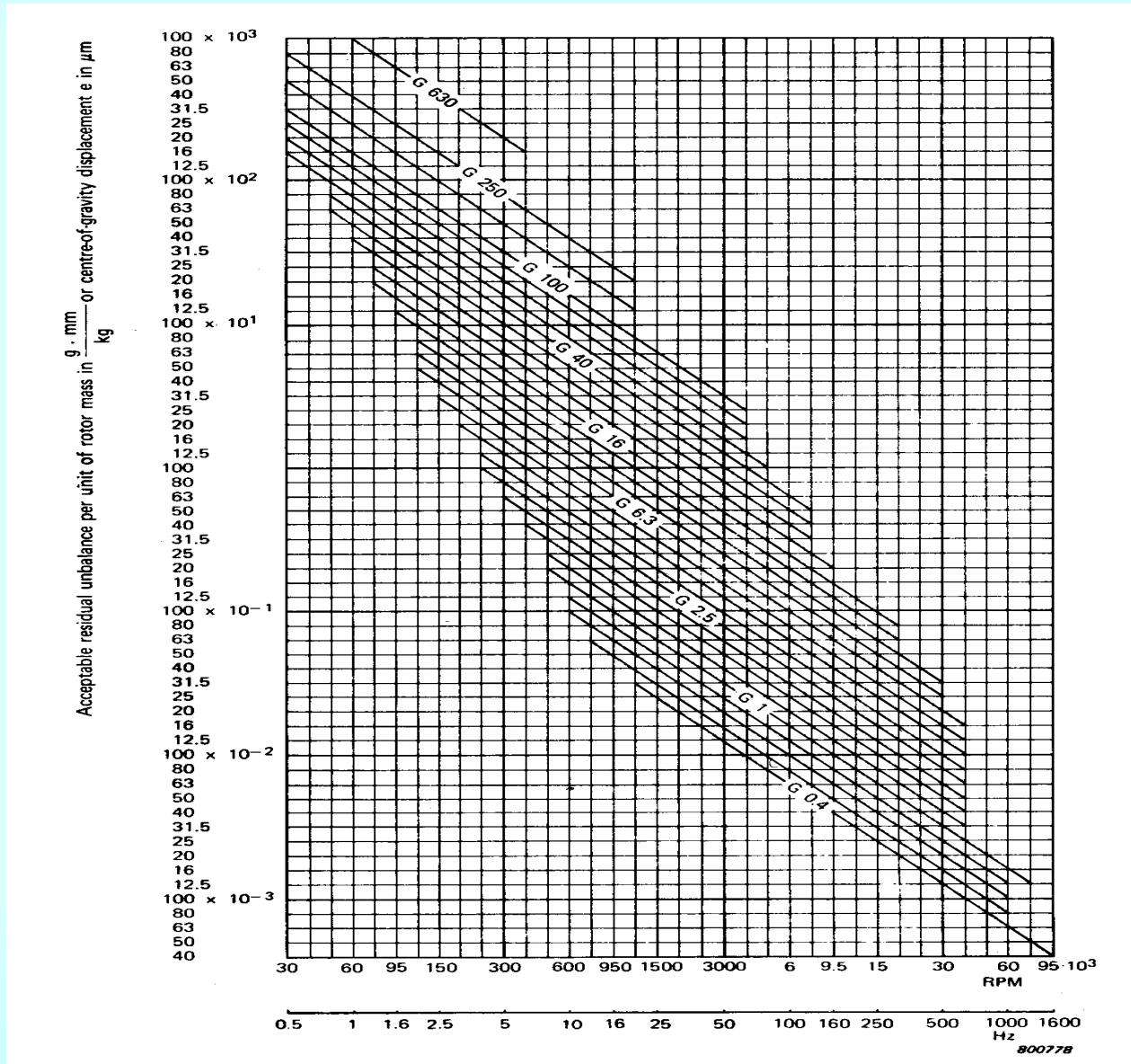
平衡等級標準的設定(ISO 1940, Balancing Grades for Various Groups of Representative Rigid Rotors)

Balance Quality grade	Product of the Relationship ($e_{\text{per}} \times \omega$) ^{1), 2)} mm/s	Rotor types-General examples
G4000	4000	Crankshaft/ drives ³⁾ of rigidly mounted slow marine diesel engines with uneven number of cylinders ⁴⁾
G1600	1600	Crankshaft/ drives of rigidly mounted large two-cycle engines
G630	630	Crankshaft/ drives of rigidly mounted large four-cycle engines Crankshaft/ drives of elastically mounted marine diesel engines
G250	250	Crankshaft/ drives of rigidly mounted fast four-cycle engines ⁴⁾
G100	100	Crankshaft/ drives of fast diesel engines with six or more cylinders ⁴⁾ Complete engines (gasoline or diesel) for cars, trucks and locomotives ⁵⁾
G40	40	Car wheels, wheel rims, wheel sets, drive shafts, Crankshaft/ drives of elastically mounted fast four-cycle engines (gasoline or diesel) with six or more cylinders ⁴⁾ , Crankshaft/ drives of engines of cars, trucks and locomotives
G16	16	Drive shafts (propeller shafts, cardan shafts) with special requirements, Parts of crushing machines, Part of agricultural machinery, Individual components of engines (gasoline or diesel) for cars, trucks and locomotives, Crankshaft/ drives of engines with six or more cylinders under special requirements
G6.3	6.3	Parts of process plant machines, Marine main turbine gears (merchant service), Centrifuge drums, Paper machinery rolls; print rolls, Fans, Assembled aircraft gas turbine rotors, Flywheels, Pump impellers, Machine-tool general machinery parts, Medium and large electric armatures (of electric motors having at least 80 mm shaft height) without special requirements, Small electric armatures, often mass produced, in vibration insensitive applications and/or with vibration-isolating mountings, Individual components of engines under special requirements
G2.5	2.5	Gas and steam turbines, including marine main turbines (merchant service), Rigid turbo-generator rotors, Computer memory drums and discs, Turbo-compressors, Machine-tool drives, Medium and large electric armatures with special requirements, Small electric armatures not qualifying for one or both of the conditions specified for small electric armatures of balance quality grade G6.3, Turbine-driven pumps
G1	1	Tape recorder and phonograph (gramophone) drives, Grinding-machine drives, Small electric armatures with special requirements
G0.4	0.4	Spindles, Discs, and armatures of precision grinders, Gyroscopes

- 1) $\omega = 2\pi n/60$ $n/10$, if n is measured in revolutions per minute and w in radians per second.
- 2) For allocating the permissible residual unbalance to correction planes, see clause 7.
- 3) A crankshaft/ drive is an assembly which includes a crankshaft, flywheel, clutch, pulley vibration damper, rotating portion of connecting rod, etc.
- 4) For the purposes of this part of ISO 1940, slow diesel engines are those with a piston velocity of less than 9 m/s; fast diesel engines are those with a piston velocity of greater than 9 m/s.
- 5) In complete engines, the rotor mass comprises the sum of all masses belonging to the crankshaft/ drive described in note 3 above.

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平衡等級標準的設定(Maximum residual unbalance as laid down in ISO 1940)



平衡的要求與等級標準

振動量與振動等級的判別

一般的不平衡振動導因於於軸承、夾治具或轉子的基座結構等等原因。

為了解機械於轉子運轉時之狀態，可以振動大小來作較方便的判斷以決定機械是否該作保養。下表為一方便的判斷標準,當振動量大時，超出允許極限時則必需作平衡校正

ISO 2372 “Mechanical Vibration of Machines with Operating Speeds from 10 to 200 rev/s”

45	Not permissible	Not permissible	Not permissible	Not permissible
28				
18	Just tolerable	Just tolerable	Just tolerable	Just tolerable
11.2				
7.1	Allowable	Allowable	Allowable	Allowable
4.5				
2.8	Good	Good	Good	Good
1.8				
1.12	Good	Good	Large machines with rigid and heavy foundations whose natural frequency exceeds machine speed.	Large machines operating at speeds above foundation natural frequency (eg. Turbo-machines)
0.71				
0.45	Small machine, up to 15 kw.	Medium machines 15-75 kw or up to 300 kw on special foundations.		
0.28				
0.18				

Vibration criterion chart