

Application Guidance Notes: Technical Information from Cummins Generator Technologies

## AGN 123 – Rotor Balancing

### DESCRIPTION

The rotor assembly in an AvK or STAMFORD alternator is balanced to an accuracy better than grade G2.5 pitched at 1800rpm, to comply with the requirements of ISO 21940-11:2016 – Mechanical Vibration – Rotor Balancing – Part 11: Procedures and Tolerances for Rotors with Rigid Behaviour. This document establishes procedures and unbalance tolerances for balancing rotors with rigid behaviour. It specifies the magnitude of the permissible residual unbalance, the necessary number of correction planes, the allocation of the permissible residual unbalance to the tolerance planes, and how to account for errors in the balancing process. In ISO 21940-14, the assessment of balancing errors is considered in detail to the fundamental work conducted for rotor balancing under ISO 19499, which gives an introduction to balancing. ISO 21940-12 is also considered, although this is for the balancing of rotors with flexible behaviour. With due consideration to these regulatory standards, the engineering design of rotor assemblies for AvK and STAMFORD alternators is such that the limit is set, for the production balancing process, at G1.9.

All two bearing alternators are balanced with a 'half-key': BS ISO 7130:2013 - Specification for Mechanical Balancing of Rotating Machinery: Shaft and Fitment Key Convention.

### BALANCING METHOD

The rotor balancing is achieved by the addition of weight[s] at both the drive end and non-drive end of the rotor assembly.

At the **Drive End**, the required balancing weight is attached to the cast aluminium cooling fans.

Where a plastic cooling fan is used – on small STAMFORD alternators - a shaft mounted metal hub has a predrilled circle of holes for the attachment of balancing weight[s]. The plastic fan is also bolted to this hub.

At the **Non-Drive End**, the following methods are employed:

- On small STAMFORD alternators, weight(s) are fitted under the exciter rotor winding out-hang or weight is added in the form of metal ‘cylindrical’ bars, which are inserted into the exciter rotor lamination pack.
- Larger STAMFORD alternators are primarily balanced by the addition of weight to the non-drive end of the main rotor core pack. The weights are located under the rotor winding out-hang. When required, additional ‘trimming’ metal weights are bolted to the exciter rotor lamination pack.

The maximum allowable balancing weight is set at 0.2% of total rotor weight.

### **TORSIONAL DATA**

The information published on the ‘Torsional Drawings’ providing details of ‘Moments of Inertia’, is accurate information based on typical mass values for all the materials associated with rotor construction. ‘Moments of inertia’ are established by mass and radius considerations. The effect to published  $WR^2$   $\text{kgm}^2$  values of balancing weights can be considered insignificant.

If it becomes necessary for the rotor to be re-wound, or rebuilt, then for the benefit of equipment reliability and so life expectancy of the Generating Set, it is imperative that the rotor is re-balanced to the within grade G2.5.