

Turbo Technics Ltd.

2 Sketty Close, Brackmills, Northampton. NN4 7PL. U.K.
 Tel: +44 1604 705050 Fax: +44 1604 769668
 Internet: www.turbotechnics.com
 e-mail: vsr@turbotechnics.com



TURBO TECHNICS LTD

HIGH-SPEED (VSR) CORE BALANCING MACHINES

Introduction

Since 1984, Turbo Technics have designed and manufactured a range of turbocharger core balancing machines. Three models are currently available, the Mk3, the Mk4P and the Mk5P are supplied to customers ranging from aftermarket re-manufacturers through to OEMs. At each level, they provide a cost effective balancing solution to suit the customer's needs. The Mk3 and Mk4P are capable of balancing the small-to-medium turbos used in cars and light commercial vehicles and the Mk 5P machine has been developed to balance the medium-to-large turbos used in trucks, heavy plant and power generation. The Mk5P is now available; however the adapter list is still in its infancy but will be added to according to customer demand.

"Core balancing" ensures a turbocharger rotor assembly is balanced in its finally assembled condition, at close to normal operational speeds. The VSR process ensures a low vibration level, producing a quiet and reliable turbocharger with a long service life. It is also a highly effective quality control process, checking many aspects of the core build.

Approved by **Garrett** (Honeywell Technologies), **3K / Schwitzer** (Borg Warner Turbo Sytems), **Holset** (Cummins Technologies) and **IHI** (Ishikawajima-Harima Heavy Industries Co. Ltd.).

Designed and manufactured in the UK.

Machine Model Range

Model / Range	Mk3	Mk4P	Mk4P-A	Mk5P	Mk5P-A
Turbine wheel diameter (Approx inducer dia.)	25-70 mm	25-70 mm	25-70 mm (Opt.85mm)	65-125 mm	65-125 mm
Typical production - units per 8hrs (approx)	1-20	20-40	20-80	1-35	35-80

Turbo Technics Ltd.

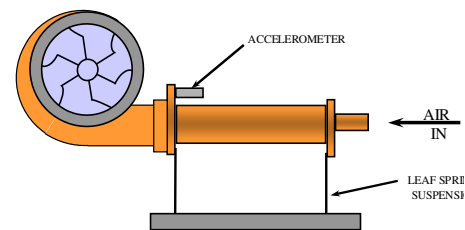
2 Sketty Close, Brackmills, Northampton. NN4 7PL. U.K.
Tel: +44 1604 705050 Fax: +44 1604 769668
Internet: www.turbotechnics.com
e-mail: vsr@turbotechnics.com



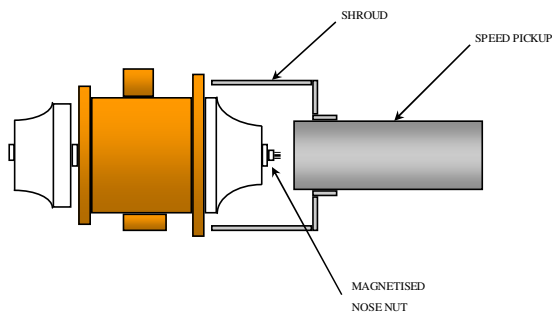
The High-speed Balancing Process

Turbochargers are assembled from component parts, which are separately balanced using conventional low-speed balancing machines, and both the turbine wheel and compressor wheel are normally balanced in two planes. At the turbine end, the balance is not affected by assembly into the cartridge, but at the compressor end, small errors in the wheel, the shaft, the thrust collar and the nose nut can cause an accumulation of balance error. At high speed, this can result in a noisy turbocharger, and in severe cases can cause premature bearing failure.

This imbalance can be corrected by running the assembled cartridge at high speed on a flexible suspension, measuring the vibration response, and either changing the assembly position or removing metal from the nose to achieve an acceptable balance. This operation usually requires the unit to be run at speeds close to the normal service operating speed, typically 100,000 to 250,000 rev/min, depending on wheel size.



In operation, the CHRA is mounted in a slave turbine housing adapter, using quick-release clamps to hold it. The turbine housing is in turn attached to a flexibly mounted air nozzle assembly, which directs air into the housing, rotating the turbine shaft. An accelerometer attached to the flange measures the vibration of the complete assembly.



The compressor wheel is covered by a shroud for safety, and to reduce air 'windage'. The nose nut or shaft end is magnetised, and a coil in the centre of the shroud converts the rotation of the magnetic field into a voltage signal, which is processed as a speed signal.

The accelerometer and speed signals are then processed electronically to remove unwanted frequencies, giving a display of vibration level (g-level) against speed as the CHRA is accelerated up to the maximum speed. At the same time, the angular difference between the speed signal and the accelerometer signal is displayed to indicate the imbalance position.

Turbo Technics Ltd.

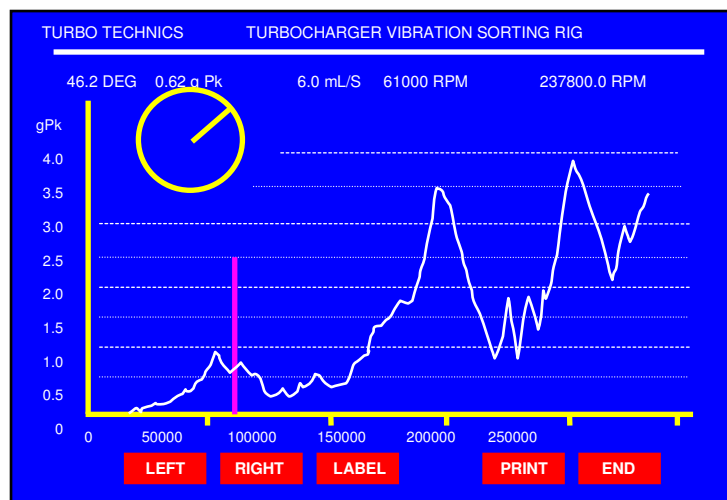
2 Sketty Close, Brackmills, Northampton. NN4 7PL. U.K.
Tel: +44 1604 705050 Fax: +44 1604 769668
Internet: www.turbotechnics.com
e-mail: vsr@turbotechnics.com



Touch Screen Display

All models incorporate a powerful computer allowing the operator to see a “picture” of the balance information as the test is run. While retaining manual speed control, the in-built screen clearly shows all the information required to carry out fast and accurate balancing. The display maps the information from the speed and acceleration sensors to construct a two-dimensional graph, plotting vibration against speed. The required balancing position is then displayed as a “clock” position on the screen.

All functions are operated by ‘virtual’ keys on the touch screen, and are completely user-friendly even without prior computer experience.



The information displayed may be printed and / or saved for future reference via a USB port.

Accessories

A wide range of turbocharger models may be VSR Core Balanced. “Turbine Housing Adaptors” are available to suit most popular turbocharger models worldwide.

Adaptors may be purchased individually or are discounted when ten or more adaptors are purchased at a time.

For a full range of turbine housing adaptors please see separate list, or visit: <http://www.turbotechnics.com/docs/vsradapters.pdf>

For full technical information on individual Turbo Technics VSR Core Balancing Machines & prices, please refer to the latest brochure.