



## Balancing Systems Based on the DC-12M



VAST provides a full range of systems for field balancing: from light systems using up to 3 balancing planes and up to 8 measurement points to professional systems with no limits.

The main features of the systems are as follows: measurement process monitoring that allows you to reduce machine runs; program algorithms to get required balancing accuracy using the minimal number of planes and trial runs; diagnostics of the shaft line problems which can reduce balancing efficiency; and estimation of balancing efficiency during calculations.

Rotar Balancing Application Software  
VHAL Professional for Windows  
Version 6.03 M 2004

**BALANCING REPORT**  
Date of Issue: 14.11.2004  
Machine: TG-6 Machine Group: Turbogenerators  
Date of Balancing: 14.11.2004

Number of Machine Modes: 1  
Number of Measurement Planes: 9  
Number of Measurement Directions: 2  
Angle reading direction: With rotation

Weight Units: g  
Phase/Angle Units: deg

**Machine Diagram**

**Measurement Planes**

Step 1 Balancing Job: Balancing  
Initial Vibration Level

Machine Mode 1 (normal)	Rotation Frequency: 3000 rpm	Amplitude Units: mm (PEAK-PEAK)	
Measurement Planes	Acceptable Levels	1 Dir. (a)	2 Dir. (b)
N (Code)	(R/Limits)	Ampl. Phase	Ampl. Phase
1	1.00	4.00	0 10.00 0
2	1.00	20.00	210 7.00 200
3	1.00	24.00	330 15.00 330
4	1.00	63.00	30 17.00 340
5	1.00	53.00	210 23.00 160
6	1.00	27.00	200 6.00 0
7	1.00	3.00	180 17.00 0
8	1.00	47.00	100 16.00 180
9	1.00	7.00	0 6.00 0

Comments:  
Probable looseness/looseness of other support structure at the following supports: 6-8

Trial Weight at plane 7

Weight	Angle
120.000	210

Vibration Response on trial weight at plane 7

Machine Mode 1 (normal)	Rotation Frequency: 3000 rpm	Amplitude Units: mm (PEAK-PEAK)	
Measurement Planes	Acceptable Levels	1 Dir. (a)	2 Dir. (b)
N (Code)	(R/Limits)	Ampl. Phase	Ampl. Phase
1	1.00	17.00	0 10.00 0
2	1.00	25.00	340 12.00 0
3	1.00	10.00	300 7.00 330
4	1.00	35.00	50 25.00 330
5	1.00	24.00	190 7.00 120
6	1.00	10.00	0 11.00 0
7	1.00	4.00	0 15.00 0
8	1.00	40.00	0 6.00 180
9	1.00	6.00	0 6.00 0

Trial mass in plane 7: REMOVED

Calculated Balancing Weights

Plane	Weight	Angle
7	106.346	187

Influence coefficients for the balancing plane 7

Machine Mode 1 (normal)	Rotation Frequency: 3000 rpm	Amplitude Units: mm (PEAK-PEAK)		
Measurement Planes	1 Dir. (a)	2 Dir. (b)	3 Dir. (c)	
N (Code)	Magnitude	Angle	Magnitude	
1	0.017775	150	0.000000	0
2	0.057911	82	0.005148	157
3	0.073137	318	0.032664	300
4	0.168859	78	0.041009	18
5	0.143388	195	0.081709	144
6	0.143388	164	0.027273	150
7	0.383036	150	0.000000	150
8	0.248385	109	0.018187	150
9	0.004545	230	0.000000	0

Balancing done with the instruments:

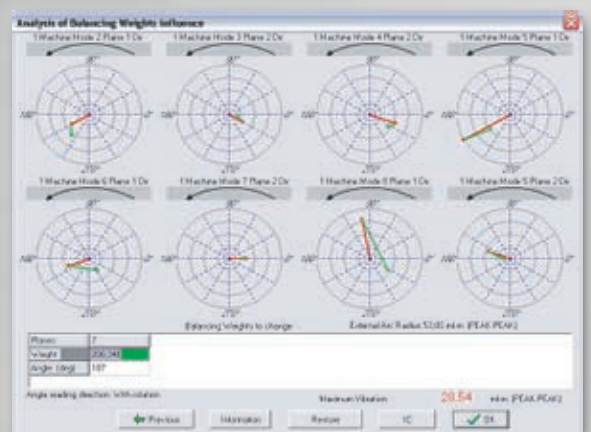
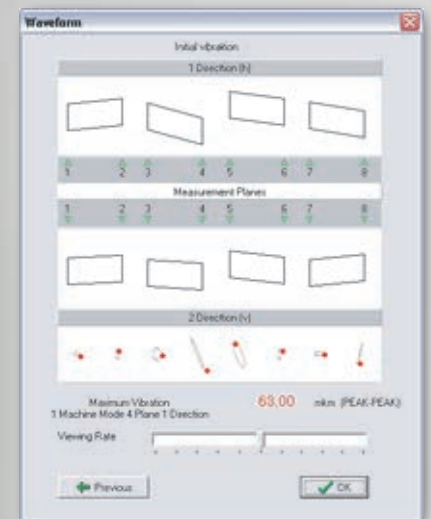
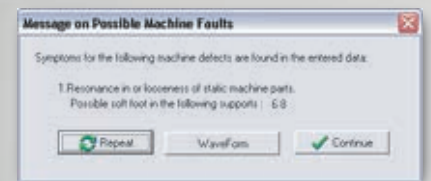
Operator: \_\_\_\_\_ Signature: \_\_\_\_\_

On the left, you can see a part of a report on turbo-generator balancing using 15 balancing planes and 9 measurement planes that is automatically generated by VBalPro32M.

The upper picture on the right shows a warning of a faulty shaft line detected by VBalPro32M. Timely correction of the defects allows you to reduce the costs and time of faulty machine balancing attempts.

Besides automatic calculation of the balancing weights and diagnostics, the systems provide vibration analysis in many ways. It is possible to view and estimate mode shapes of the machine under balancing in all measurement directions and build a model of mode shapes.

The next option is analysis of balancing weight influence, shown as vector plots, upon machine vibration in all measurement planes. In this way, you may estimate the influence of any balancing weight in all measurement points prior to its mounting. Vector diagrams are shown with red vectors for initial vibration and green vectors showing vibration change due to balancing weight mounting.



# Product Specifications

## Basic set



The basic set includes DC-12M, vibration transducer and tacho probe, cables, mains adapter (charger). The instrument contains built-in balancing software VbalInt, and Vibro-12, which is used in an external computer. A nylon carrying bag is furnished with the set.

## Additional Accessories



Multiplexers for multi-channel measurement system with the DC-12M which can be operated also via computer. The multiplexer AVPb-16icp on the left-hand photo is equipped with built-in battery and can be used to measure run-up/coast-down amplitude-phase-RPM response.



Also, many other accessories are available such as earphones to listen to a signal from the transducer, a number of vibration sensors, phase reference probes, cables etc.

## VBalLit, VBalInt

These programs are for field balancing using up to 3 planes and 8 measurement points and balancing with/without removal of trial weights. They also provide reduction of balancing planes and machine runs. The tacho signal is monitored during measurements. The measurement process is stopped automatically when the required accuracy is obtained. Spectral components with difference of 0.01% can be identified.

The programs automatically detect conditions that may decrease balancing efficiency:

- Low reliability of the vibration measurement data.
- Too small trial weight.
- Linear dependence between balancing planes.

The software can be installed either on DC-12M (VBalInt) or onto the computer (VBalLit). In the latter case, you can use any instrument to collect amplitude and phase data at machine running speed. Also, you may use DC-12M or transducers of stationary/stand systems from VAST.

## VBalPro32M

The software supports up to 16 balancing planes and 64 measurement points, as well as balancing machines with 8 operating modes (which are different by running speed or loads, for example). It includes diagnostic modules for detection of operator's errors in measurements and weight mounting, as well as the machine defects which make balancing hard to obtain. It allows you to reduce number of planes and trial runs.

The software enables you to

- Reduce vibration in some of operating modes to optimize at the expense of other modes.
- Calculate balancing weights for a part of balancing planes with known influence coefficients.
- Manually change parameters of the balancing weights and view their influence upon vibration vector graphs.
- Reduce vibration level not only to zero but also to predefined amplitude and phase distributions which allows you to take into consideration thermal unbalance with no machine heating.
- View mode shapes which are calculated by vibration amplitude and phase values at operating speed.

The software displays estimated values of vibration phase and amplitude at all measurement points as well as the minimal vibration level which can be obtained with the given number of balancing planes.

The software is installed on a PC. Any instrument to measure vibration amplitude and phase at the machine operating speed can be used including DC-12M and transducers of stationary and stand systems made by VAST.

## Run-up/Coast-down Balancing

All the above software allows you to enter measurement results manually - with the keyboard. You may use also amplitude and phase data acquired by the multi-channel system during run-up and coast down so that the preliminarily field balancing can be performed without going to standard operating mode.

## M-Modifications

Software which has its name ended with M (VbalLitM, VbalPro32M) allows you to balance not only by mounting/removal of balancing weights but also by relocation of non-removable weights. Such a balancing is performed in two balancing planes and at 4 measurement points.

## Balancing Without Tacho Probe

VBal7 allows you to balance machines without tachometers, explicitly by the overall vibration level if it depends on unbalance. The "three-run" technique is used with the trial weights spaced at 120°. Balancing is performed in two balancing planes and at two measurement points.



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