SMART BALANCER Standard and Optional Equipment

Standard

- 1 Smart Balancer measuring instrument with built in rechargeable battery, operating dialog in English, German, French or Spanish
- 2 piezoelectric acceleration sensors SA-011, with:
  1 short sensor probe
  1 long sensor probe
  2 holding magnets for flat surfaces
  2 holding magnets for curved surfaces
  2 connecting cables, 5 m long
- 1 laser optical reference sensor, with 1 magnetic stand, 2 sets of reflective tape, 1 connecting cable, 6 m long
- 1 CD-ROM with operating manual in English, German, French and Spanish, with device firmware and Smart Report software
- 1 PC connecting cable, 1,5 m long
- 1 power and charger unit
- 1 soft case for transporting the measuring instrument and accessories

Options

- **Option 01**
  1 additional acceleration sensor with two sensor probes, 2 holding magnets, 1 connecting cable 5 m long
- **Option 02**
  1 extension cable for acceleration sensor, 10 m long
- **Option 03**
  1 connecting cable for laser optical reference sensor, 15 m long
- **Option 04**
  1 calibration adapter for verification and auto calibration of the signal conditioners of the measuring instrument
- **Option 05**
  1 USB-RS232 Converter
- **Option 06**
  1 printed and bound operating manual, either in English, German, French or Spanish

SCHENCK

Balancing and
Diagnostic Systems

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SCHENCK

SMART BALANCER

Precision Balancing Anytime, Anywhere

RP 1140 uk

SMART BALANCER An Integral Solution for Field Balancing

Smart Balancer:
A compact, 2 channel balancing instrument providing high ease of operation, polar display of unbalance and test run vectors, an optimisation method for balancing, and PC assisted generation of a balancing report.

Rotor unbalance – a major cause for machine vibration problems

The major reason of mechanical failure and the majority of machine malfunctions are caused directly or indirectly by vibrations from an unbalanced rotor condition. During operation unbalanced rotors will generate high centrifugal forces and create mechanical vibration that leads to premature bearing wear, fatigue cracking, sudden rupture or shaft deformation. These vibrations can also present a danger to operating staff, and may result in undesirable downtime for plant and machinery.

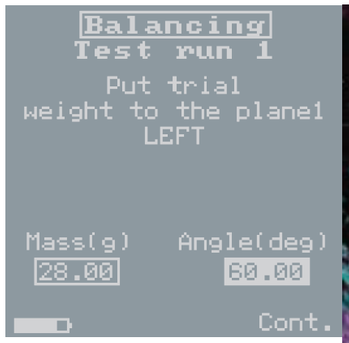
Rotor unbalance can also have a significant impact on quality assurance requirements for many applications such as in the machine tool industry, for example. An unbalanced spindle can cause non-symmetrical rotation resulting in poor surface finish, decreased dimensional accuracy and lower tool life.

Standard features provide a complete package to eliminate unbalance

Schenck's Smart Balancer is the ideal tool for accurately identifying an unbalance condition, determining the state of balance of your machines, enabling corrective action to eliminate an unbalance condition. A unique combination of features gives operators complete on site field balancing capability and come as standard in every Smart Balancer. The compact, battery powered instrument enables rotors to be balanced quickly, accurately and cost efficiently, without dismantling the machine. Rotors of almost any size or weight can be balanced in one or two balancing planes, i.e. statically and dynamically.

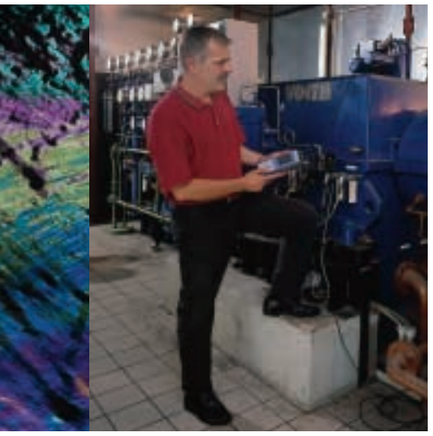
Field balancing made easy

With high ease of operation, universal application and field proven accessories, the Smart Balancer makes field balancing of rotors easy – even for less experienced staff. Operators are prompted through the steps necessary to measure and eliminate rotor unbalance in a user friendly environment. An optimisation program enables unbalance vibrations to be recorded at up to four sensor positions and be reduced to a minimum by balancing in one or two planes.



Operating dialog-
With a clearly structured operating dialog Smart Balancer guides the user through the entire balancing process.

SMART BALANCER Field balancing and more



Robust and versatile
Smart Balancer provides you with a range of functions for measurement and analysis, which you will not only find useful for field balancing, but which will also be beneficial for machine commissioning, service and maintenance.

Measurement and assessment of the machine status

Vibration is an excellent indicator of the status of individual machine components and of the machine as a whole. With Smart Balancer you can perform a broadband measurement of absolute bearing vibrations to ISO 10816 and compare the measured values with the specified limits, in order to ascertain whether the machine can still be operated, or whether field balancing is necessary.

Machine diagnosis – Detecting the causes of vibration

To determine the causes of vibration, the Smart Balancer provides two methods for performing FFT frequency analysis:

- FFT analysis with constant absolute bandwidth ...
  That can be synchronized with a reference signal from the rotor to view an order spectrum and easily distinguish between rotor related problems and non-rotor related problems.
- Smart FFT with constant relative bandwidth ...
  To provide faster measurement results, easier interpretation of the data, and identify on-going damage at earlier stages.

Both methods enable vibration mixtures measured on a machine to be separated into their harmonic portions and displayed with frequency and amplitude in the form of spectral lines.

On the basis of the measured frequencies, causes of vibration can be detected and unbalanced rotors identified.

Detection of machine and mounting resonance

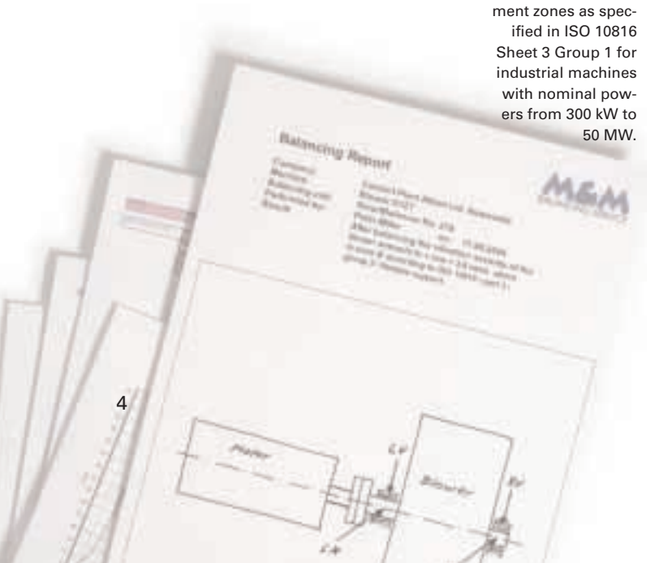
Measurement and graphical presentation of amplitude and phase angle of vibrations occurring at the frequency of rotation as a function of speed enable machine and mounting resonance to be determined. This helps to ensure field balancing is performed in a resonance free speed range.

Additional diagnostic tools

For more extensive machine diagnosis, the Smart Balancer enables the characteristics of the overall vibration as well as amplitude and phase angle of the 1st harmonic to be determined and plotted as a function of time. With the help of the oscilloscope function the vibration pattern can be displayed as a function of time and stored.

Limits of assessment zones as specified in ISO 10816 Sheet 3 Group 1 for industrial machines with nominal powers from 300 kW to 50 MW.

Support class	Zone boundary	rms displacement *in µm*	rms velocity *in mm/s*
rigid	A		
	B	29	2,3
	C	57	4,5
	D	90	7,1
flexible	A		
	B	45	3,5
	C	90	7,1
	D	140	11,0



Powerful field balancing functions

A unique feature allows operators up to four measurement points to reduce error, providing complete versatility and high accuracy. A variety of combinations are therefore possible such as simultaneous horizontal and vertical measurements, or two horizontal and two vertical measurements.

Correction locations can be identified in polar or component form based on the configuration of the rotor that is being balanced. Rotors that have limited correction locations, such as a fan, can be easily balanced with the component correction feature. Users are free to define the available correction locations on the rotor whether they are equally or unequally spaced.

Archiving and documenting balancing results with Smart Balancer Report

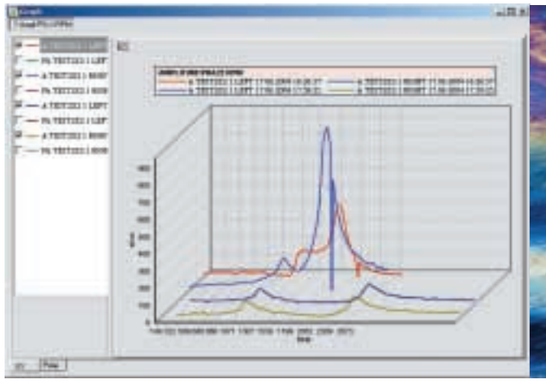
All balancing results can be recorded in the Smart Balancer along with a description of the machine, sensor position, date and time.

Measurement data can also be downloaded to a PC or laptop for filing and further analysis using Schenck's Smart Report PC software supplied with the balancer. The Smart Report software offers a user friendly environment to store and manage unbalance data. Users can create expert balancing reports with Bode and Nyquist plots and cascade/waterfall charts. Measurement results can also then be imported to other programs in the Windows Office suite such as Word or Excel for further processing.

Balancing and more
Smart Balancer covers the most common vibration measurement tasks, providing you with a powerful tool for machine diagnosis

Standard features at a glance

- *FFT analysis with constant absolute bandwidth*
- *Smart FFT with constant relative bandwidth*
- *Tracking function to identify resonance*
- *Vibration overall measurement*
- *Oscilloscope (time waveform function)*
- *Static/dynamic balancing*
- *Polar graphic display*
- *Up to 4 measurement points obtainable*
- *Polar & component correction*
- *Smart Balancer Report Software*



Smart Balancer Report Software allows operators to view vibration data in a variety of formats such as Bode, Nyquest, Cascade and Listing Plots

SMART BALANCER Technical Data

Measurement tasks
- Field balancing of rotors in one and two planes
- Measurement of overall vibrations for evaluation of the machine condition
- Frequency analysis for identification of machine faults and damages
- Start-up and run-down analysis of the first harmonic for the detection of machine resonance's
- Display of the overall vibrations as well as of the first harmonic vs. time
- Visualisation of vibration time-signature

Measurement channels
- 2 channels for vibration
- 1 channel for rotor speed and reference signal

Measurement inputs
- 2 inputs for acceleration sensors
- 1 input for laser optical reference sensor

Measurement values
- Vibration displacement in µm and mils
- Vibration velocity in mm/s and inch/s
- Vibration acceleration in m/s^2 and g

Signal detection types
- RMS value
- Peak-to-peak value
- Peak value

Field balancing
- Easy-to-understand operator dialog, integrated balancing calculator, polar presentation of unbalance and test run vectors and printed balancing reports via PC/Laptop.
- Balancing rotor speed: 120 to 20,000 rpm.
- Number of balancing planes: 1 or 2.
- Number of measuring points: up to 4 (enables optimised balancing procedures).
- Archiving of rotor influence coefficients to enable simplified balancing procedures in repeat situations.

Measurement of overall vibrations
- Broadband vibration measurement in pre-selectable frequency ranges
- High-pass steps 2/5/10/20/50/100/200/500/1,000 Hz
- Low-pass steps 100/200/500/1,000/2,000/5,000/10,000 Hz
- Number of averages: 0 up to 100

Frequency analysis
- Narrow band measurement for separation of the machine vibration into their harmonic portions.
- FFT analysis, either without external trigger (free run) or with rotor-synchronous data acquisition.
- High-pass steps: 5/10/20/50/100/200/500/1,000 Hz
- Low-pass steps: 100/200/500/1,000/2,000/5,000/10,000 Hz
- 2./5./10./20. harmonic with rotor-synchronous data acquisition.
- Resolution: 100/200/400/800 lines
- Number of averages: 0 to 100
- Windowing functions: Hanging and Uniform (Rectangular)
- Smart FFT analysis in the frequency range 5 to 10,000 Hz by means of 33 frequency bands with a constant relative bandwidth (26%) and with logarithmic graphical display.

Start-up and run-down analysis
- Measurement, archiving and graphical display of the amplitude and the phase angle of the first harmonic in pre-selectable rotor speed ranges.
- Max. rotor speed range: 120 to 9,000 rpm
- Resolution: 100 lines.

Overall vibration and first harmonic vs. time
- Measurement, archiving and graphical display of the characteristic values for overall vibration as well as for amplitude and phase angle of the first harmonic in pre-selectable time ranges.
- Number of averages: 0 to 100.
- Number of depictable data sets: 5 to 100

Vibration time-signature
- Visualisation of the vibration waveform.
- Frequency range: 2 to 10,000 Hz, with rotor-synchronous data acquisition up to the 20. harmonic.
- Sampling period: 2/5/10/20/50/100/200/500/1,000/2,000/5,000 ms
- Number of samples: 256/512/1,024/2,048
- Number of averages with rotor-synchronous data acquisition: 0 to 100
- Number of depictable data sets: 5 to 100
- Resolution: 256/512/1,024/2,048 points

General features
- Display: Monochrome LCD with 128 x 128 Pixel and backlit.
- A/D-converter: 14 Bit resolution
- Storage capacity of the internal EEPROM memory: 2 MB (for firmware and measurement data)
- Accuracy of the indicator unit: 5%
- Serial interface RS-232C for data upload to PC/Laptop with a rate of 9,600 to 115,200 baud.

Power supply
- With built-in rechargeable battery, storage capacity:1,6 Ah.
- Typical battery operation period: not less than 6 h.
- Battery charge time: not more than 3 h.
- Power and charger unit for 100 to 240 V, 50/60 Hz. Delivery includes an adapter for common plug standards.

Mechanical construction of the indicator unit
- Aluminium housing of rugged and shock-proof design.
- Protection class IP 54
- Operating temperature range: -10° to +50° C
- Relative air humidity: 0 to 95%, not condensing.
- Dimensions: 220 x 110 x 38 mm
- Weight: 1,200 g

Softcase
- Dimensions: approx. 300 x 250 x 200 mm
- Weight incl. standard extent of delivery: approx. 3,5 kg.