



A Users Guide To The Westwind Test Set D1280-02 (part 34426)



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Safety information

Electrical safety – General warning

The voltages used in the test set and from the drive unit can cause severe electrical shock and/or burns, and could be lethal. Extreme care is necessary at all times when working with the test set and drive.

The installation must comply with all relevant safety legislation in the country of use.

Warning

The case covers must not be removed without first isolating the test set unit mains supply and the motor supply whether it is from a converter or direct from mains supply. When in use, case covers must be fitted and the case must be earthed (grounded).

Note

The internal supply to the various modules is at mains voltage.

The maximum voltage that can be used on the test set is 500 volts between lines and 500 volts to the case (ground).



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Introduction

The Westwind test set has been designed specifically to meet the needs of air bearing spindles to check that spindles are operating correctly for both converter driven and mains driven motors. It will also measure speed, volts, current and vibration on spindles.

The test set must be used in accordance with Westwind procedures and processes for testing spindles.

The voltage, current and vibration readings are in true R.M.S. This is necessary for reading correct values of voltage and current when using frequency converter drives, as the waveform is stepped rather than sinusoidal.

The input frequency is monitored and rotational speed measured by various types of pickup probes. By measuring both rotational speed and input frequency in revolutions/cycles per second, slip can be calculated.

Pressing the RPM button will change the reading from the frequency to RPM if required. An over-speed trip circuit is incorporated which may be wired to switch off the converter drive automatically should a preset speed be exceeded.

The complete unit gives simultaneous readings of five parameters and so replace this number of individual instruments. It also saves a considerable amount of wiring and special input circuitry that individual instruments would require. The revolutions per second reading may be obtained from the optical pickup head, a magnetic inductive probe or a hall effect device.

Provision has been made for mounting a card adjacent to the meters on the front panel; the card should show typical reading for a particular spindle under test so that a comparison with actual reading can be made.



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Accessory list

1 off optical speed pickup
(Spares part number 34182)



1 off speed probe adaptor assy
(Spares part number 34196)



1 off B.N.C. to croc clip cable assy
(Spares part number 34428)



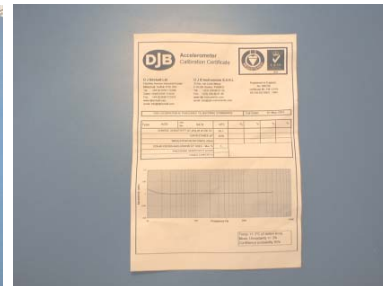
1 off Accelerometer cable
(Spares part number 34427)



1 off Accelerometer transducer
(Not supplied as a spare item)



1 off transducer calibration cert.
(Not supplied as a spare item)



1 off mains cable assy
(Spares part number 34046)



1 off B.N.C to B.N.C cable assy
(Spares part number 34426)



1 off users guide





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Specification

Hz

Range 20 – 5000 Hz with input volts greater than 10. Internally connected to L2 and L3 phase lines

Revs/sec

Tachometer reading revolutions per a second with choice of three inputs switchable for 1,2 or 6 pulses per a revolution

Optical

For use with optical speed probe assembly supplied, looking at a 50/50 black/white marking on the shaft at a distance of 0.2 to 0.4 inches (5 to 10mm). Or the magnetic hall effect which is an AC coupled Schmitt triggered integrated circuit that switches in response with the cut outs in the shaft, this gives a square wave output and operates with supply voltage between 4.5 to 24 volts.

Magnetic - Inductive

Minimum signal 0.5V peak-to-peak and maximum signal of 100 v peak-to-peak

Resistive – Hall effect

Internal feed resistor 470 ohms form +5v connected when switched to this position.

RPM Button

While pressed Hz and Revs/Sec reading are changed to RPM. The number indicated is in hundreds of revolutions per minute.



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Volts

The reading is true RMS between 10 to 500 VAC only. Selected by switch.

L1 reads between L1 and L2.

L2 reads between L2 and L3.

L3 reads between L3 and L1.

Amps

The reading is true RMS between 0.25 to 20A AC only. Short-term 30A. Selected by L1, L2 and L3.

Vibration

Reading velocity from 0.02 to 15 mm/second. Frequency response 12 Hz to 8 KHz (-3dB points). The transducer is best mounted with beeswax and may be used to measure axial or radial vibration as required.

Note – the charge amplifier will need re-calibration if the transducer is changed.

Power Requirements

The instrument requires a single-phase 50/60 Hz supply with a loading of about 40 VA. Input voltage is 110/240 volts with ground lead, which must be used for safety as the unit is fitted with filter capacitors and has a metal case. The unit is set for 220v and will operate between 210 to 240 volts.

Accuracy

Wherever possible 1% tolerance components have been used in measuring circuitry and when operated in ambient temperatures between 10 and 30 °C, results are comparable with most good multimeters.



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Overspeed trip

The Hz counter is fitted with a trip circuit, which may be set at any desired frequency by the decade switch adjacent to the Hz display. If Hz exceeds this setting, the LED above the switch comes on and a relay inside the unit operates. The relay is powered only when the unit is switched on and Hz does not exceed the setting. If the relay contacts are wired in the converter safety circuit, overspeed protection is provided. The circuit will reset automatically when Hz reaches zero.

Probe Output

This may only be used to check hall effect speed sensor signal level on certain spindles e.g. D1201 type. It is used in association with the 3-wire speed probe adapter. The signal is coupled via BNC connector. Red and green LED indicators show "PASS" or "FAIL". Pass requires a signal in excess of 1.0V peak to peak.

Physical size of Cabinet

The unit is housed in a standard 6U style metal case with integral handles and tilt feet, so that the cabinet may be angled for easier operation. The overall size is 493mm wide, 317mm deep and 288mm high, and is finished in a blue paint.



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Analogue Outputs

Labelled BNC sockets

These outputs are DC voltage calibrated amplifiers (with respect to 0v/ground) and have relatively high impedance (5K maximum load) enabling them to be used without load resistors to drive oscilloscopes or chart recorders direct. Care should be taken when connecting: Connect the 0v/ground lead first to avoid possible damage to the internal IC amplifiers.

The voltage levels are as follows:

Hz	1mV per Hz	max 3V for 3000 Hz
Revs/Sec	1mV per rev	max 3V for 3000 revs/sec
Voltage	1mV per volt	max 0.5V for 500V
Amps	1mV per Amp	max 0.3V for 30A see spec
Vibration	100mV per mm/sec	max 1.5V for 15mm/sec

Note: Hz and Revs/sec outputs have sampling time in order of 0.3 sec



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Connections

Access to the terminals within the case is achieved by removing the top and back covers. On older units the top cover is secured by two screws at the rear of the unit, the remaining five screws secure the back panel. The top panel is located on two spigots at the front of the unit. When replacing the top ensure the spigots have not moved out of alignment with the holes in the top cover.

On newer units seven screws on the rear panel secure the top cover and back panel. All seven screws need to be removed to allow access and removal of the panels. Two plastic spigots are located on the front panel holding the top cover to the front panel, when re-fitting top cover to unit that these spigots have not moved out of alignment with the holes in the top cover.





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Terminal layout

Once the rear cover has been removed you will have access to the terminal blocks. The 8-way terminal block is for the phase connections and earths for the converter and spindle. The 4-way terminal block is for the over-speed trip and the thermistor input (if required).



Connect the terminal blocks as follow from left to right:

Terminal block 1 pin 1 = phase 1 of spindle
 Terminal block 1 pin 2 = phase 2 of spindle
 Terminal block 1 pin 3 = phase 3 of spindle
 Terminal block 1 pin 4 = phase earth of spindle
 Terminal block 1 pin 5 = phase 1 of converter
 Terminal block 1 pin 6 = phase 2 of converter
 Terminal block 1 pin 7 = phase 3 of converter
 Terminal block 1 pin 8 = phase earth of converter

Terminal block 2 pin 1 = over-speed trip
 Terminal block 2 pin 2 = over-speed trip
 Terminal block 2 pin 3 = thermistor input
 Terminal block 2 pin 4 = thermistor input

Notes:

- 1) Converter maximum voltage 500 volts at 20 amps.
- 2) Over-speed maximum voltage 250 volts at 2 amps.
- 3) If thermistor input not required / not present link between terminals must be fitted.



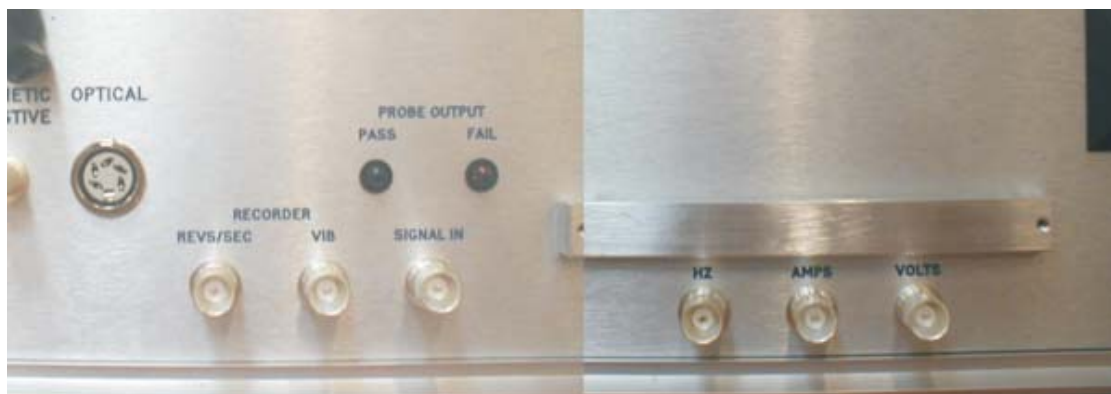
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Connectors on front panel of unit

Located on the lower left hand side of the front panel are the speed probe inputs. Either induction/magnetic resistive or optical/magnetic hall effect, the induction option is for very old design spindles and is rarely used.



There are also 5 B.N.C. sockets located on the front cover for low voltage D.C. output signals suitable for monitoring purposes for revs/sec, vibration, Hz, amps and volts, the signal in is the input from the optical speed probe adaptor.



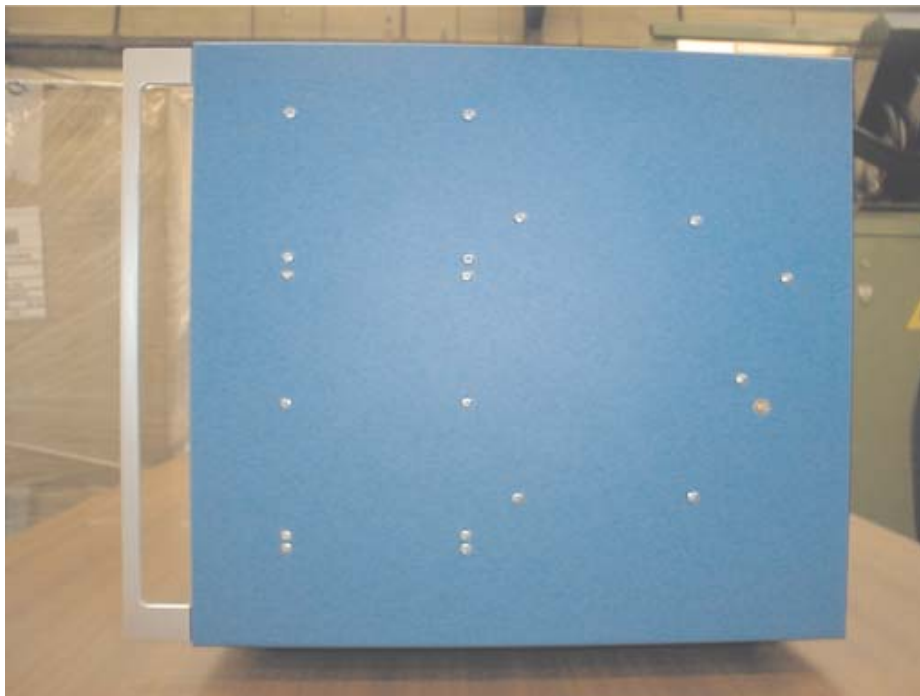


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Connector on right hand side of unit

Located on the right hand panel of the unit is a small coaxial socket. This is for the accelerometer transducer for measuring the vibration and is interconnected to the transducer via the supplied accelerometer cable assembly. Care must be taken during assembly due to the fragile wires.

The unit is calibrated for use with the transducer supplied. The reference number of the transducer matched is recorded on the unit by this coaxial socket.





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Operating notes

The following notes are intended to help in the set-up of the Westwind Test set and should be used in conjunction with the appropriate Westwind process sheet for the spindle under test.

Testing should be carried out on a suitable bench with static protection and should be on a solid floor to ensure no problems with background vibration. The unit requires access to the controls and at least 4 inches (100mm) clearance at the rear of the unit for ventilation purposes.

One mains single phase electrical output (for test set) and one 3-phase electrical output (for converter) are required, one for the converter and the other for the test set. The test set supply required is 220-240 volt single phase and ground at 0.5 amp rating. The test set is designed for 220-volt operation but will operate down to 210 volts without alteration.

A space is required adjacent to the instruments for running the spindle under test. Ensure the spindle is securely held to the bench within a safety box cradle in accordance with Westwind procedures and process sheets (for high speed rear end thrust spindles process sheet PS1-068).

For safety reasons, ensure the power supply to the converter is switched off during connection and disconnection of spindle and test set before proceeding. Connect the test set to the converter as detailed in the connection details, connect the spindle phase wires and thermistor to the test set (it is recommended to use a spindle interconnection terminal box for ease and safety). The thermistor is a protection device built within the motor to ensure overheating protection. These are non-linear PTC (positive temperature coefficient) devices. On reaching a defined temperature (usually defined 100 degrees C), the resistance goes high very quickly, changing within +/- 5 degrees C from 550 ohms to more than 1330 ohms.



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The test set circuit monitors this and trips at resistance values more than 1100 ohms and resets below 850 ohms, well within the above limits. The trip circuit contacts should be wired in series with the air pressure switch to inhibit the converter output.

The optical speed pickup assembly supplied is fitted with an infrared L.E.D. and sensor. A section of the spindle shaft protrusion requires a section to be blackened (avoid collets section and marked shafts), a black marker pen is usually satisfactory for this but in extreme rare cases a matt black paint has been used, the metallic finish is satisfactory as the reflective surface (on a number of spindles there are two flats on the shaft these may be blackened for pickup). The optical pickup needs to be set at a distance of between 0.2 to 0.4 (5 to 10mm) away from the shaft to obtain a clear signal, ensure that the test set is set for the correct number of counts per a revolution (blackened areas on the shaft). The distance is important if the recorder outputs are being used to obtain any x-y plot of vibration against speed.

Some spindles are fitted with speed sensors. The input selector switch on the front panel enables these to be selected. The optical position is used as defined in the previous paragraph and also for the magnetic hall effect sensor, the magnetic inductive position is used on a few older style spindles, which produces a voltage usually 1 or 2 pulses per a revolution and the pulses per rev switch needs to be set accordingly. The majority of spindles are fitted with magnetic resistive 2 or 3 wire devices (3 being the standard).





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The two-wire device is connected via the B.N.C. to croc clip cable assembly with the red or black clips connected to the two wires (it does not matter which is connected to what colour). The B.N.C connector is to be plugged into the magnetic resistive socket on the test set (under the pulses per rev switch). The pulses per a rev switch to be set, as defined on the outline drawing (usually 6 pulses per a rev).



The three wire device is connected via the speed probe adaptor assembly which is plugged into the optical input ensuring that the selector is set to optical on the test box and the spindle probe wires are connected to the adaptor colour to colour with the larger diameter green wire being as an earth connection. This prevents interference from the motor affecting the speed-readings. The B.N.C. to B.N.C. cable is to be used to interconnect the adaptor to the signal in input on the test set. Ensure that the revolutions-per-second switch is correctly selected.

The accelerometer (or vibration transducer) is used for measuring vibration and should be used in conjunction with a spindle-clamping ring to suit spindle body size. The clamp is normally fixed 0.5 inches back from the nose end of the spindle with the accelerometer in line with the cable entry, and vertical, to ensure similar conditions are achieved for testing spindles.

The accelerometer cable assembly (sometimes referred to as the vibration transducer cable) interconnects the accelerometer to the test set via the small coaxial connector on the side of the unit - the accelerometer is calibrated with the test set but the cable can be replaced or repaired without re-calibration.



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This cable is of the low noise type and has a back conductive layer between the inner insulated wire and the screening braid. When re-connecting an end plug, it is essential that this be removed from the clear insulated inner conductor for about 2mm to 3mm at the end. The transducer output is very low voltage and very high impedance, so this type of cable is essential. An unstable vibration reading usually signifies a cable problem or alternatively a bad connection.

The main purpose of the test set is to check a spindle for correct operation, ensuring that the volts, amps and vibration are correct for the required speed. All three phases are easily checked for their appropriate voltages and currents by switching the L1, L2 and L3 selector. A large difference in the readings (greater than 10%) usually indicates a problem, either a wrong voltage or a faulty winding provided that the air bearings are floating correctly. High vibration indicates a balance problem, requiring a new shaft and spacer.

X-Y/t recorder

When used in conjunction with the Westwind test set, a pen recorder provides a permanent record of a spindles performance. The voltage signals required to drive the recorder are obtained from the labelled B.N.C. socket situation on the front panel. These low level DC outputs are calibrated and suitable for connecting directly to the recorder. The relevant output levels are listed within this document (refer to specification section under analogue outputs). The recorder operating instructions should be referred to for setting up the recorder, including mains voltage adjustment.

Two-phase spindles

When using the test set to check two-phase spindles, the Scott pair of transformers used to generate two phases from a three-phase supply should be connected between the test set and the spindle.



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Test Bench Circuit Layout

The below diagram illustrates a typical test bench circuit layout. Although not designed for this specific application, some details may be of use.

