



power tool institute, inc.

1300 SUMNER AVENUE, CLEVELAND, OHIO 44115-2851 216-241-7333 FAX 216-241-0105
E-Mail: pti@powertoolinstitute.com URL: www.powertoolinstitute.com

PTI PROCEDURE FOR DETERMINING POWER TOOL HORSEPOWER

1.0 STANDARD CONDITIONS FOR MEASURING HORSEPOWER

- 1.1** The power supply for corded devices is a circuit providing the nominal system voltage appropriate for the power tool or motor in accordance with the applicable ANSI standard. For cordless power tools, testing shall be performed with a fully charged battery provided with the power tool.
- 1.2** The test shall be performed under ordinary indoor conditions. Before the test is initiated, the power tool, battery pack, if any, and the ambient room temperature are between 20 and 30 degrees Celsius, (approximately 68 to 86 degrees Fahrenheit). Ambient temperature is maintained during the test.
- 1.3** All components of the power tool or the motor which consume power and interact with the electrical circuit, including the integrated power cord, the switch, speed controls and fuses, if any, are in the circuit so that all normal electrical losses in the power tool or the motor are reflected by the measurement. If the product cannot be used without an extension cord, a cord consistent with any instructions accompanying the product must be included in the circuit. Electrical output accessories may be removed from the power tool for purposes of the test.
- 1.4** No alterations to the power tool or the motor are made to affect losses such as from friction or windage, so that all normal mechanical losses in the power tool or the motor are reflected by the measurement. Accessories which are used with, but not part of, the power tool (such as but not limited to grinding wheel, drill bit, saw blade) are not attached to the power tool during the test.
- 1.5** A device such as a dynamometer that measures the work done by the power tool or motor, as applicable, is used to generate measurements in determining the horsepower. The testing shall be non-destructive of the test sample.

- 1.6** The maximum permissible measurement error in the direction of overstating horsepower shall be 5%.
- 1.7** Testing conducted in ISO certified facilities, by or under the supervision of personnel trained to perform standard lab testing procedures, testing to standards established by Nationally Recognized Testing Labs, shall be considered to be of sufficient accuracy to satisfy this requirement. Reliance in good faith upon the testing results of a third party ISO certified facility professing to perform testing to standards established by Nationally Recognized Testing Labs shall constitute compliance with this requirement.

2.0 DEFINITIONS

- 2.1** Horsepower is a unit of power equal to 550 foot-pounds per second. As applied to a power tool or its motor, the output [p1] (or developed) horsepower is determined by multiplying the speed (in revolutions per minute), by the torque generated at that speed (in foot-pounds), divided by 5250.

Algebraically, this definition can be written as follows:

$$HP = [RPM \times \text{Torque (ft lbs)}] / 5250$$

- 2.1.1** Peak Motor Horsepower - the maximum value of horsepower measured at the motor shaft. Peak motor horsepower is sometimes referred to as “peak horsepower”, “maximum motor horsepower”, or “horsepower”.
- 2.1.2** Peak Tool Horsepower - the maximum value of horsepower measured at the tool's output. This is also referred to as “maximum tool horsepower.”
- 2.1.3** Continuous Duty Motor Horsepower - the maximum value for horsepower that a motor can produce continuously at the motor shaft without exceeding the current rating of the motor/tool. This is also referred to as “continuous duty horsepower”.
- 2.1.4** Continuous Duty Tool Horsepower - the maximum value for horsepower that a tool can produce continuously at the tool output without exceeding the current rating of the motor/tool.
- 2.2** Measurement error means any aspect of measurement or methodology which results, or potentially results, in a deviation between actual and measured horsepower . Potential sources of measurement error include lack of synchronicity between torque and RPM measurements, error resulting from

measurement of loss of inertia or other stored energy, nonlinearity, hysteresis, testing at a speed and load different from any encountered in actual usage, and temperature effects. Horsepower available only during deceleration shall be considered measurement error.

2.3 Power tool means any instrument or apparatus, corded or cordless, that is designed for use in performing an operation and that is powered by an electric motor.

2.4 Actual usage means any manner of use of the power tool that is consistent with the function and use of the power tool as prescribed by the manufacturer.

3.0 HORSEPOWER MEASUREMENTS

3.1 The measured horsepower of any power tool is not valid unless : (i) a sample of the power tool is capable of attaining that horsepower in actual usage, and (ii) a sample of the power tool has been shown to be capable of attaining that horsepower under standard conditions.

3.2 The measured horsepower of any motor used in a power tool is not valid unless a sample of the motor has been shown to be capable of attaining that horsepower under standard conditions.