

Species Settings Questions & Answers

For Wagner Meters Orion® Models



**WAGNER
METERS**
Unleash Your Expertise

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Question and Answers

#1 Gradients and Wet Pockets

Q: What about gradients and wet pockets?

A: Although the various drying processes for green lumber can leave wet cores and pockets, moisture continues to pass from fiber to fiber within the wood until it has equalized throughout the whole board, and then to surrounding humidity levels. Determining if a board or load of lumber will equalize within tolerance levels can be challenging, but moisture meters from Wagner Meters provide this information automatically. Penetrating deep into the wood, they mathematically determine equalized moisture content and are capable of checking truckloads of board feet for specified moisture content in minutes. For even more convenience, many companies use their hand-held meters from Wagner Meters to read right through the plastic wrapping around the wood on new deliveries before they allow unloading!

#2 Surface Moisture

Q: Is my moisture meter from Wagner Meters affected by surface moisture?

A: Most moisture meters can be affected by standing water or visible water on the board. You should always wipe off as much excess water as possible. Once the standing water is removed, your moisture meter from Wagner Meters will read slightly higher than normal, whereas other types of meters can show greatly exaggerated readings.

The Orion® 910, 930, 940, and 950 moisture meters feature Wagner's IntelliSense™ technology*, going beyond the surface conditions for accurate measurements of moisture conditions inside the wood. Our hand-held moisture meters with IntelliSense™ technology measure moisture **IN** the wood, not **ON** the wood, giving fast, highly accurate moisture measurement for woodworking or wood flooring projects. In addition, it works without damage to the wood surface.

*Active in 3/4" mode only

***NOTE:** If water is allowed to soak into the wood, it will naturally show higher moisture content. If a piece of wood is very rough, it will soak up the water quite readily, affecting readings for all meters.*

Species Setting Table

Species	Setting
Afromosia	0.65
Alder, Red	0.41
American Red Oak	0.63
Andiroba	0.57
Ash, Black	0.49
Ash, Blue	0.58
Ash, Green	0.56
Ash, Oregon	0.55
Ash, Red	0.55

Ash, White	0.60
Aspen, Bigtooth	0.39
Aspen, Quaking	0.38
Avodire	0.51
Baldcypress	0.46
Balsa	0.14
Balsamo (Myroxylon balsamum)	0.83
Balsamo (Protium spp.)	0.55
Banak (Virola spp.)	0.45
Basswood, American	0.37
Beech, American	0.64

Beech, Euro	0.67
Benge (Guibourtia arnoldiana)	0.70
Birch, Paper	0.55
Birch, Sweet	0.65
Birch, White	0.53
Birch, Yellow	0.62
Box	0.83
Brazilian Cherry	0.83
Brazilian Mahogany	0.47
British Elm	0.53
Bubinga (Guibourtia spp.)	0.75

Butternut	0.38
Cativo	0.42
Cedar of Lebanon	0.53
Cedar, Alaska	0.44
Cedar, Atlantic White	0.32
Cedar, Eastern Red	0.47
Cedar, Incense	0.37
Cedar, Northern White	0.31
Cedar, Port Orford	0.43
Cedar, Western Red	0.32
Cedar, Yellow	0.44
Cedrella	0.39

Cherry, Black	0.50
Chestnut, American	0.43
Cocobolo	0.85
Cottonwood, Balsam Poplar	0.34
Cottonwood, Black	0.35
Cottonwood, Eastern	0.40
Degame	0.72
Determa	0.55
Dogwood, Flowering	0.72
Douglas Fir	0.48
Ebony	0.94

Elliotis Pine	0.59
Elm, American	0.50
Elm, Rock	0.63
Elm, Slippery	0.53
English Cherry	0.58
English Oak	0.57
European Ash	0.58
European Walnut	0.56
Fir, Balsam	0.35
Fir, California Red	0.38
Fir, Grand	0.37
Fir, Noble	0.39

Fir, Pacific Silver	0.43
Fir, Subalpine	0.32
Fir, White	0.39
Gombeira	1.00
Guatambu (Argentinean)	0.70
Guatambu (Brazil)	0.79
Gum, Black	0.50
Gum, Red	0.52
Hackberry	0.53
Hemlock, Eastern	0.40
Hemlock, Mountain	0.45
Hemlock, Western	0.45

Hickory (Pecan), Bitternut	0.66
Hickory (Pecan), Nutmeg	0.60
Hickory (Pecan), Water	0.62
Hickory (True), Mockernut	0.72
Hickory (True), Pignut	0.75
Hickory (True), Shagbark	0.72
Hickory (True), Shellbark	0.69
Hickory, Pecan	0.66
Holly, American	0.55
Hophornbeam, Eastern	0.70
Hura	0.40
Indian laurel	0.79

Ipe	0.99
Iroko	0.57
Jacaranda	0.34
Jarra	0.75
Jelutong	0.38
Kapur	0.70
Karri	0.79
Keruing (Dipterocarpus spp.)	0.76
Kingwood	1.16
KOA (Acacia Koa)	0.63
Larch, Euro	0.48

Larch, Western	0.52
Laurel, California	0.55
Lignum Vitae	1.13
Limba	0.40
Locust, Black	0.69
Macassar Ebony	0.90
Madrone, Pacific	0.64
Magnolia, Southern	0.50
Mahogany, African	0.44
Mahogany, True	0.47
Manni	0.63
Maple, Bigleaf	0.48

Maple, Black	0.57
Maple, Hard	0.60
Maple, Red	0.54
Maple, Silver	0.47
Maple, Soft	0.49
Maple, Sugar	0.63
Merbau	0.67
Mersawa	0.54
Mesquite	0.86
Monkeypod	0.50
Mountain Ash (Eucalyptus spp.)	0.62

Muninga	0.59
Myrtle, Oregon	0.55
Myrtle, Tasmanian	0.64
Oak (Red), Black	0.61
Oak (Red), Cherrybark	0.68
Oak (Red), Laurel	0.63
Oak (Red), Northern	0.63
Oak (Red), Pin	0.63
Oak (Red), Scarlet	0.67
Oak (Red), Southern	0.59
Oak (Red), Water	0.63
Oak (Red), Willow	0.69

Oak (White), Bur	0.64
Oak (White), Chestnut	0.66
Oak (White), Overcup	0.63
Oak (White), Post	0.67
Oak (White), Swamp Chestnut	0.67
Oak (White), Swamp	0.72
Oak, California Black	0.53
Oak, White	0.68
Obeche	0.32
Okoume	0.35
Olive	0.81

Opepe	0.68
Padauk (<i>Pterocarpus indicus</i>)	0.57
Padauk (<i>Pterocarpus macrocarpus</i>)	0.79
Padauk (<i>Pterocarpus macrocarpus</i>)	0.71
Parana Pine	0.49
Pecan	0.60
Peroba de Campos	0.66
Peroba Rosa	0.71
Persimmon, Common	0.71

Pine, Hoop	0.44
Pine, Eastern White	0.35
Pine, Jack	0.43
Pine, Loblolly	0.51
Pine, Lodgepole	0.41
Pine, Longleaf	0.59
Pine, Pitch	0.52
Pine, Pond	0.56
Pine, Ponderosa	0.40
Pine, Red	0.46
Pine, Sand	0.48
Pine, Shortleaf	0.51

Pine, Slash	0.59
Pine, Spruce	0.44
Pine, Sugar	0.36
Pine, Virginia	0.48
Pine, Western White	0.35
Poplar, Yellow	0.42
Plane (Lacewood)	0.49
Primavera	0.42
Purpleheart	0.71
Radiata Pine	0.45
Ramin	0.56
Redwood, Old-Growth	0.40

Redwood, Young-Growth	0.35
Roble (Tabebuia spp.)	0.55
Rosewood, Brazilian (Dalbergia nigra)	0.84
Rosewood, Indian	0.79
Rubberwood	0.51
Sapele	0.60
Sassafras	0.46
Scots Pine	0.45
Spanish Cedar	0.44
Spruce, Northern	0.36
Spruce, Black	0.42

Spruce, Engelmann	0.35
Spruce, Red	0.40
Spruce, Sitka	0.40
Spruce, White	0.36
Sweet Chestnut	0.51
Sweetgum	0.52
Sycamore, American	0.49
SYP (Southern Yellow Pine)	0.56
Tamarack	0.53
Tanoak	0.64
Tatajuba	0.72

Tauari (<i>Couratari</i> spp.)	0.53
Tawa (<i>Beilschmiedia tawa</i>)	0.62
Tawa (<i>Pometia</i> spp.)	0.58
Teak	0.57
Tupelo, Black	0.50
Tupelo, Water	0.50
Virola (<i>Virola</i> spp.)	0.45
Walnut, Black	0.55
Wenge (<i>Millettia</i> spp.)	0.82
Willow, Black	0.39
Yellow-Poplar	0.42
Yew	0.63

Zebrano	0.77
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Plywood, OSB, and MDF	Setting
Plywood	0.57
OSB	0.62
Permacore MDF	0.70
HDF core	0.85
AdvanTech™	0.60

Species Setting Data Sources

These settings are based on the best, most current world data and are used to determine the species correction factor within the meter. The values provide average density values for the species. A coefficient of variation (COV) of about 10% describes the variability inherent in many common domestic (US) species.

If your lumber is not listed in the Species Settings Tables provided, or you are dealing with an unknown species, the value may be determined by referring to the “Determining Specific Gravity” section on page 31. Additional resources are:

- Wagner Meters online Species Settings: www.wagnerspecies.com
- Woodworker’s Source (Wood Library): www.woodworkerssource.com/wood_library.php

- The Wood Handbook: www.fpl.fs.fed.us/documnts/fplgtr/fplgtr113/fplgtr113.htm
- The Forest Products Lab: www.fpl.fs.fed.us/

The Orion® series meters can be used to measure non-wood materials if the density is similar to wood products. Non-wood species can be measured by using the meter reading as a relative value such as in “go/no-go” applications, or when determining if one measurement area contains more moisture than another, i.e., measurements that do not require a high absolute accuracy. Specific gravity formulas can’t be applied to non-solid wood species due to the presence of glues and resins, which cause a non-linear moisture content curve. If greater accuracy is required, the ASTM oven-dry procedure can be used to determine a meter correction value for non-solid woods.

Please contact Wagner Meters at (877) 958-3331, a worldwide toll-free number, for additional information on species corrections if needed.



Footnote:

1 Species Setting Value Sources

The species setting values were developed by Wagner Meters. These values are based on our research and have been developed to give users a general correction factor for plywood and OSB. Please keep in mind that plywood and OSB manufacturing processes can differ slightly and some plywood and OSB of the same species may vary slightly.

Commentary on Species Adjustment

In 1992, a study was conducted at the Forest Research Laboratory of Oregon State University (OSU) on species correction for the hand-held moisture meters from Wagner Meters. The species tested were Douglas Fir, Lodgepole Pine, Western Red Cedar, Western Hemlock, White Fir, Western Larch, Engelmann Spruce, and White Oak. Three to four 40-piece samples of each species were tested. Specific gravity was found to be the primary factor in species adjustment. A species equation as a function of specific gravity and the meter reading was obtained using the multiple-regression technique (R-square = 0.95) as follows:

$$AF = 8.77 + (0.25 * MM) - (15.86 * SG) - (0.62 * SG * MM)$$

In which:

AF = Species Adjustment

MM = Meter Reading

SG = Specific Gravity in oven dry weight and 12% moisture content volume basis.

The species adjustments provide the adjusted moisture measurements that are based on the species adjustment determined using the species adjustment equation, with rounding to the nearest 0.5.

Wood is not a uniform material. The specific gravity of solid-sawn lumber varies within the piece and among pieces. In the OSU study, the average specific gravity for each species differed from the individual sample by plus or minus 1% to plus or minus 8%. For general applications, average specific gravity values can be found in the Wood Handbook (USDA Agriculture Handbook No. 72, 1999). Except for one species, for which the experimental value is 7% higher, the species' overall average specific gravity values obtained in the OSU study are comparable with those in the Wood Handbook. The exception may be caused by unknown biases in the sampling scheme.

The Wood Handbook values are used in the tables, except for the imported species, unless otherwise noted.

Species adjustment can be determined for lumber sorted, or otherwise known, to have specific gravity different from the species' average. One example is lumber graded under the Dense rules. If the specific gravity of a lumber sample is known, species adjustment can be determined by the species adjustment equation.

The species adjustment equation provides a way to expand the use of your hand-held moisture meter from Wagner Meters for lumber of any species groups having similar species-specific gravity values. One example is Hem-Fir. For a species group, one way to determine the species adjustment is by the use of a weighted average of the individual species' average specific gravity values. The weighing procedure used in the ASTM D2555 by standing timber volume can be used. Species adjustment is not recommended for any species group having a broad range

of species-specific gravity values. There are no recognized limits on species group species adjustment. Species adjustment for species groups should be used with knowledge on the variability on species involved and the effect of it on species adjustment. If the species mix in the lumber production of a species group is controlled or known to have specific gravity different from that used for the species group, a better estimation of species adjustment can be determined using the known specific gravity in the above species correction equation.

Determining **Specific Gravity**

Determining the species setting for an unknown species.

The Species Setting Tables, based on specific gravity of solid wood, are provided in this manual. If you don't know the species of the wood you are using, or the specific gravity differs from the handbook because of a different growing region, use the following procedure.

Determining the Specific Gravity

1. Select a sample of wood that is approximately 12% moisture content, with all edges being true. Carefully measure the dimensions of the sample using a caliper. You will need the length, width, and thickness.
2. Convert these measurements to feet.

- Carefully measure the weight of the sample
- Convert the weight to pounds.
- Calculate specific gravity.

Example:

Length = 10 in.

$10 \text{ in.} / 12 \text{ in.} = 0.833 \text{ ft.}$

Width = 7 1/2 in.

$7 \frac{1}{2} \text{ in.} / 12 \text{ in.} = 0.625 \text{ ft.}$

Thickness = 1 1/2 in.

$1 \frac{1}{2} \text{ in.} / 12 \text{ in.} = 0.125 \text{ ft.}$

Volume = L x W x T

$0.833 \times 0.625 \times 0.125 = 0.065 \text{ cu. ft.}$

Weight = 20 oz.

$20 \text{ oz.} / 16 \text{ oz.} = 1.25 \text{ lb.}$

Specific Gravity:

(Weight / Volume) / Specific Gravity of
water (1.25 lb. / 0.065 cu. ft.) / 62.34 lb.
/ cu. ft. = 0.31

In order to ensure that the value obtained for the specific gravity is statistically significant, a number of pieces must be measured and the average determined. Use this value of specific gravity for the species setting in the meter.

Checking the Moisture Content in Veneer

You can check the moisture content in veneer with your hand-held moisture meter from Wagner Meters as follows:

1. Put veneer into a tight stack of at least 3/4 of an inch and separate the stack by at least 3 inches to 4 inches from the rest of the stack. Measuring a stack less than the scan depth of the meter will give you a reading that is lower than the true moisture reading. Refer to the species adjustment table for the wood you are using.
2. Avoid electrostatic discharge (ESD) at all times. Wagner Meters' warranty does not cover ESD damage. The instruments are tested to withstand a 15 KV static charge but not the typical 150 - 250 KV found in a veneer charge.

The veneer table should be earth grounded with a metal wand attached by wire to the table. The wand must then be run up and down the edge of a veneer stack to discharge static, or the person using the moisture meter must have a Velcro® wristband with a tethered strap which is grounded.

These same static precautions apply to lumber moving from a planer; the hand-meter is not an in-line measurement system. This unit is meant to check lumber while stationary.

If these guidelines are adhered to, the risk of ESD damage to your moisture meter is greatly reduced or eliminated. Please call the factory if you have any questions or concerns about this information.