Timber Check™ Moisture Meter

(99N15.01)

The following instructions were provided by the manufacturer.

Using Your Timber Check Moisture Meter

Step 1. Push the pins into the wood sample.

Step 2. Turn the dial up until the red indicator light comes on. This is the moisture content.

Note:

- *The red indicator light will remain on at all levels **above** the correct level.*
- *Ensure that you are at the lowest value that will turn the red light on.*
- *If the red indicator light is on at all levels, then the wood moisture content is the lowest value (≤ 6%).*
- *The red light will be on at all levels if the pins are not touching wood.*

Step 3. Turn the dial to "OFF" when not in use.

Since wood is not a homogeneous material, readings may vary slightly from place to place on a sample. For the most accurate results, readings should be taken from a cut section, at least 8" (20cm) in from the end. The reading should be taken immediately after the cut is made. If this is not possible, a series of readings should be taken along the length of the board. The pin probes should be pushed in about 3/16" (5mm). Readings should never be taken from the end of a board that has been exposed to the air for any length of time.

If you are seasoning wood and require many accurate readings over a period of time, two small nails can be driven into the wood 5/8" (16mm) apart and left there during the drying process. The nails should be driven in to half the thickness of the board. Readings can then be taken by touching the pin probes to the nail heads.

The indicator light may not come on when the meter is used in very wet woods. **If the indicator does not come on**, the moisture content is greater than 40%.

The exact moisture content reading will vary slightly from species to species. The Timber Check Moisture Meter is calibrated with red oak. The included table will provide the required adjustment for 74 other species of wood.

The meter is calibrated for wood at 20°C (68°F). If the temperature of the wood being tested varies significantly from this value, the wood temperature adjustment table should be used.

Some additives such as inorganic preservatives or the adhesives used in plywood may cause erroneous readings. Adhesives can be checked by first testing only the top of the wood, and then pushing the pins through the layer of adhesive to see if the reading changes.

The Timber Check Moisture Meter can also be used to measure the relative

moisture content of other building materials, including gyproc, wallboard, concrete, brick, etc. Readings will be a **relative value only**. For very hard or delicate materials, the pin probes can be touched gently to the surface of the material.

If the "POWER" light does not turn on, the battery should be replaced, even if the red indicator light still works. To replace the 9V battery remove the two screws at the pin probe end. Gently pull the end off and remove the battery.

If the pin probes become damaged, they can be easily replaced by removing the end in the same manner. Peel off the insulating foam that protects the mounting screws. Push the pins through the end cap and remove the complete pin assembly from the cap. Remove and replace the pins. Additional replacement pins are available.

Moisture Content

Knowing the exact moisture content of the wood you are working with is very important. Using wood that is not at the appropriate moisture content can result in warping, swelling, cupping, splitting, or loose joints in your finished work.

Over 50% of a living tree's weight is moisture. This moisture content is expressed as a percentage of its "oven-dry weight". This means that to determine the moisture content of a piece of wood you must first weigh it, and then oven-dry it until it no longer loses weight. This oven-dried weight is then subtracted from the initial wet weight and the difference is divided by the oven-dry weight.

[((wet weight - dry weight) /dry weight) x 100] = % moisture

Although this method is the most accurate, it is not practical for anyone other than researchers. Your Timber Check Moisture Meter will give you instantaneous readings, accurate to within 1% in the critical 6 to 12% range.

Moisture in wood is contained both within its cell cavities and in the cell walls. As wood dries, moisture first leaves the cell cavities (free moisture). When the cells are empty, but the cell walls are still saturated (bond moisture), it is said that the wood has reached its "fiber saturation point". This is about 30% for most woods.

Wood will not change dimensionally until it is dried beyond the fiber saturation point. As the moisture is removed from the cell walls, the cells begin to shrink. Maximum shrinkage takes place as the wood dries from 20% down to 10%.

Seasoning Wood

The object of drying or "seasoning" wood is to bring the moisture content of the wood down to an acceptable level quickly, but gently, to avoid distortion. This results in wood that is lighter, stronger, and less susceptible to splitting, warping, cupping and rot.

There are two methods of seasoning wood, air-drying and kiln-drying.

Air-drying reduces the moisture content to 15 to 20%. Usually it takes about one year for every inch of thickness to air-dry hardwoods. Soft woods will air-dry in about half that time. With exceptionally dry weather, air-dried wood may reach 12%.

Kiln-drying can dry wood to any given moisture content in a matter of weeks. Heated air is used to drive out the moisture and steam is used to control the rate of

evaporation to avoid distortion and splitting. Dehumidifiers are sometimes used in small kilns as a method of drying wood without heat. This process is much easier on the wood.

Equilibrium

Wood is always susceptible to changes in surrounding humidity levels. It will try to reach a state of equilibrium with the surrounding atmosphere. When lumber leaves the kiln and is stored outside, it will gradually pick up moisture from the air until it reaches an equilibrium level. Not matter how old the wood is, it will always respond exactly the same way to environmental changes.

Fortunately, wood responds very slowly; therefore, day-to-day changes in humidity can usually be ignored and only seasonal changes considered.

When green wood has been dried down to an equilibrium level, additional waiting time will not dry it further, but aging wood does have certain advantages. Mature wood will have its remaining moisture more evenly distributed and will therefore be even less likely to distort.

For fine woodworking, lumber should be kiln-dried to a moisture content below the required level and then stored in an atmosphere that will permit it to reach an equilibrium level that will be maintained throughout the building and finishing process.

Shrinkage

An understanding of how wood shrinks is important if fine woodworking is to be undertaken. Wood does not shrink equally in all directions. It will shrink along the direction of is annual rings (tangential shrinkage) about twice as much as it shrinks between its rings (radial shrinkage). There is practically no shrinkage in length.

If a plank is cut tangentially, the greatest amount of shrinkage will be across its width. If cut radially, the greatest amount of shrinkage will be in thickness. Therefore, radially cut lumber is more stable, with less tendency to distort.

Gauging Wood Movement

The amount of shrinkage varies considerably from one species to another. The included table lists the approximate amount of tangential and radial shrinkage for common species of wood over a 7% change in moisture.

Looking at the table we see that a piece of ash, 12" wide, dried from 20% down to 13%, would shrink tangentially 1/4" and radially 5/32".

The table also gives you the ratio of tangential to radial shrinkage (T/R ratio). The higher this ratio, the greater the chance of the species "cupping". This type of distortion is also dependant on the direction the grain is running in the plank (cut radially or cut tangentially).

The table also provides an approximate rating for each species that refers to the likelihood of warping and twisting. Generally speaking, species whose tangential shrinkage and radial shrinkage rates are similar are less likely to distort.

To calculate the amount of dimensional change you can expect for a specific piece of wood, just remember that wood movement is directly proportional to width and

the change in moisture content. An 18" wide board will move 1-1/2 times more than the amount stated in the table for a 12" board. Also, if the moisture change expected is only 3-1/2%, then the movement will be half of what is listed for a 7% change.

Wood Rot

Your Timber Check Moisture Meter can be used to check for conditions that may indicate the presence of rot. This is particularly useful when inspecting older buildings for structural integrity.

For wood to rot, three things are required, oxygen, heat, and moisture. If these three factors exist, living fungi (rot) will attack the wood.

There are two main types of wood rot. The first is "wet rot" (white rot). This is what is usually seen outdoors on rotting logs and stumps. The other common type is "dry rot" (brown rot). This is mainly an indoor type. Since oxygen and heat are usually present, moisture then becomes the deciding factor on whether conditions are suitable for rot. Your Timber Check Moisture Meter is labelled "DRY" from 0 to 12%. In this range wood rot is impossible. In the range labelled "WET", >18%, wood rot is inevitable. In the mid-range, 12 to 18%, wood rot is possible but not likely.

These "DRY" and "WET" ranges can also be used for testing firewood. Wood that falls in the "WET" range will burn poorly and provide limited heat.

Reference Tables (Red Oak Standard)

Dimensional Changes with a 7% Change in Moisture Content						
Species	Tangential Shrinkage		Radial Shrinkage		T/R ratio (cupping)	Rating (warping)
	in/ft	%	in/ft	%		
Ash	1/4	2.08	5/32	1.30	1.6	stable
Basswood	9/32	2.34	3/16	1.56	1.5	stable
Beech	11/32	2.86	5/32	1.30	2.2	unstable
Birch	9/32	2.34	7/32	1.82	1.3	very stable
Cedar	5/32	1.30	3/32	0.78	1.7	very stable
Cherry	7/32	1.82	1/8	1.04	1.8	stable
Elm	9/32	2.34	1/8	1.04	2.3	medium
Fir	7/32	1.82	5/32	1.30	1.4	very stable
Hickory	11/32	2.86	7/32	1.82	1.5	medium
Mahogany	3/16	1.56	5/32	1.30	1.2	very stable
Maple	5/16	2.60	5/32	1.30	2.0	medium
Oak	5/16	2.60	1/8	1.04	2.5	unstable
Pine	3/16	1.56	1/16	0.52	3.0	medium
Poplar	1/4	2.04	1/8	1.04	2.0	medium
Redwood	5/32	1.30	3/32	0.78	1.7	very stable
Spruce	7/32	1.82	1/8	1.04	1.7	stable
Teak	5/32	1.30	3/32	0.78	1.7	very stable
Walnut	1/4	2.08	5/32	1.30	1.6	stable

Air-Drying Specifications	
Final equilibrium moisture content	Average relative humidity @ 22°C (72°F)
5%	24%
6%	31%
7%	37%
8%	43%
9%	49%
10%	55%
11%	60%
12%	65%

Tangentially Cut Lumber

Radially Cut Lumber

Wood Temperature Adjustment										
Meter Reading		Wood Temperature °F								
		30	**40**	**50**	**60**	**70**	**75**	**85**	**95**	**105**
		Actual Moisture Content (%)								
	22%	27.8	26.3	25.2	23.7	22.0	21.2	20.1	19.3	18.3
	18%	22.0	21.2	20.1	19.2	18.0	17.2	16.4	15.7	14.8
	14%	17.4	16.7	15.9	15.0	14.0	13.3	12.7	12.0	11.4
	12%	15.0	14.3	13.6	12.8	12.0	11.4	10.9	10.4	9.9
	11%	13.7	13.0	12.3	11.7	11.0	10.5	10.0	9.5	9.0
	10%	12.4	11.8	11.2	10.7	10.0	9.5	9.1	8.6	8.2
	9%	11.1	10.6	10.1	9.6	9.0	8.6	8.2	7.7	7.3
	8%	9.9	9.5	9.0	8.5	8.0	7.6	7.3	6.8	6.5
	7%	8.7	8.3	7.8	7.4	7.0	6.7	6.3	6.0	5.7
		0	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
		Wood Temperature °C								

Approximate Recommended Moisture Contents	
Moisture Content	Suitability
50 to 30%	Stable wet wood
22 to 14%	Outdoor furniture
14 to 12%	Indoor furniture, occasional heating
12 to 8%	Indoor furniture, average heat & humidity
≤7%	Indoor furniture, excessive heat or dryness

Species Adjustment Table

Ash, American	B	Maple, Rock	A
Ash, Black	F	Maple, Sugar	B
Ash, White	F	Oak, American Red	A
Ash, European	A	Oak, American White	A
Ash, Japanese	A	Oak, European	A
Aspen	F	Oak, Japanese	A
Balsa	A	Oak, Tasmanian	C
Basswood	F	Oak, Turkish	E
Beech	C	Olive, East African	B
Birch, European	D	Padauk, African	F
Birch, Paper	F	Persimmon	F
Birch, Yellow	E	Pine, American Pitch	C
Boxwood	A	Pine, Eastern White	A
Cedar, West Indian	D	Pine, Jack	F
Cedar, Western Red	C	Pine, Maritime	B
Cherry, American	C	Pine, New Zealand White	B
Cherry, European	D	Pine, Ponderosa	C
Chestnut	C	Pine, Red	F
Cypress	A	Pine, Scots	A
Elm, English	E	Pine, Sugar	C
Elm, Rock	E	Pine, Western White	A
Elm, White	E	Pine, Yellow	A
Fir, Douglas	B	Poplar, European Black	A
Fir, Grand / White	A	Poplar, Yellow	A
Fir, Noble	D	Ramin	F
Gum, American Red	A	Redwood, European	A
Gum, Southern	B	Redwood, Californian	B
Gum, Spotted	A	Rosewood, Indian	A
Hemlock, Western	C	Sapele	C
Hickory	F	Spruce, European	C
Jarrah	C	Spruce, Sitka	C
Larch, European	C	Sweetgum	A
Larch, Japanese	F	Sycamore	F
Larch, Western	F	Tamarack	F
Lauan / Meranti	B	Teak	F
Lime	E	Tupelo	A
Linden	E	Turpentine	C
Magnolia	F	Walnut, African	D
Mahogany, African	D	Walnut, American Black	A
Mahogany, Honduran	A	Walnut, European	C
Mahogany, Philippine	F	Walnut, New Guinea	B
Mahogany, West Indian	B	Walnut, Queensland	C
Maple, Pacific	A	Yew	C
Maple, Queensland	B		

Reading	A	B	C	D	E	F
7	7.0	8.2	8.0	10.5	8.0	7.1
8	8.0	10.0	9.5	11.0	9.3	7.5
9	9.0	10.8	10.9	11.6	9.7	7.9
10	10.0	11.7	11.5	12.2	10.4	8.6
11	11.0	12.7	12.6	13.4	11.3	9.5
12	12.0	13.6	13.7	14.3	12.1	10.5
14	14.0	15.3	15.5	16.0	13.4	11.8
18	18.0	18.2	19.7	19.1	16.3	15.0
22	22.0	21.5	24.5	23.2	19.3	18.3

*values printed here. No two trees are **exactly** alike.*

The Timber Check Moisture Meter is calibrated for wood at 20°C. Apply the wood temperature adjustment **before** the species adjustment.