



## USER GUIDE

# Moisture Meter

## Model MO220



## Introduction

Congratulations on your purchase of the Extech MO220 Moisture Meter. This instrument is a conductivity moisture meter specifically designed for the wood industry.

The instrument has eight calibration scales, enabling the user to take accurate moisture measurements in 170 wood species. Moisture measurements can be taken using the integral pin electrodes, or using the heavy duty moisture probe.

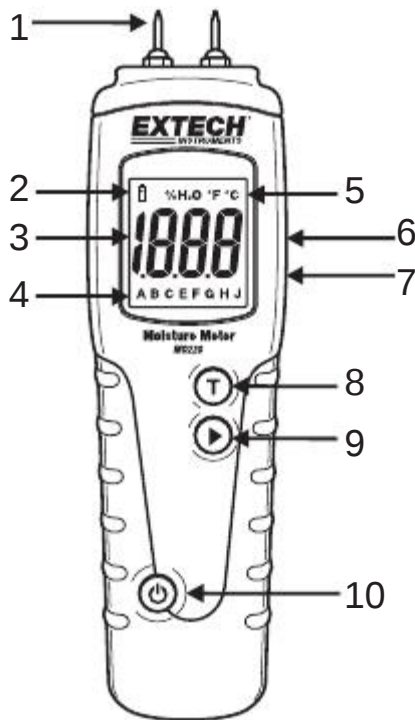
When used with the temperature probe, the moisture measurements are automatically corrected with respect to temperature. This meter is shipped fully tested and calibrated and, with proper use, will provide years of reliable service.

## Description

### Meter Description

1. Measurement pins
2. Low battery icon
3. LCD measurement reading
4. Wood group designators
5. Units of measure
6. External moisture sensor input
7. Remote temperature probe jack
8. Temperature units button
9. Wood group letter selector button
10. Power ON-OFF button

Note that the battery compartment is located on the rear of the instrument.



## Operation

**CAUTION:** The electrode measurement pins are extremely sharp. Use care when handling this instrument. Cover the pins with the protective cap when the instrument is not in use.

### Basic Measurement Instructions

1. Remove the cap to expose the needle electrodes OR connect the heavy duty moisture probe socket on the right hand side of this instrument
2. Switch the meter ON by pressing the  button.
3. Select the appropriate wood calibration scale A, B, C, E, F, G, H or J (see the Wood Calibration Tables later in this guide) using the  button.
4. Push the needle pins or the heavy duty moisture probe pins into the wood and observe the reading.
5. Press and hold the power button to shut the meter off.

### Manual Temperature Correction (for use without the Temperature Probe)

The instrument is calibrated for wood at 68°F (20°C). In general, wood that is warmer than 68°F (20°C) will give higher readings and wood colder than 68°F (20°C) will give lower readings. An approximate manual correction of 0.5% moisture content per 9°F (5°C) may be subtracted from wood that is above 68°F (20°C). For wood that is below 68°F (20°C), a manual correction of 0.5% moisture content per 9°F (5°C) may be added to the measured value.

### Automatic Temperature Correction ATC (for use with the Temperature Probe)

1. Switch the instrument on and select the appropriate wood calibration scale as detailed earlier.
2. Using a hammer and nail of a nominal 3 mm diameter, make a hole in the wood to be tested.
3. Remove the nail and push the Temperature Probe into the hole until the tip is at the required depth.
4. Connect the Temperature Probe into the instrument via the **Temp** socket.
5. Measure the wood as described earlier to obtain the automatically temperature corrected (ATC) moisture value.
6. To read the current temperature of the wood press the **T** button, the LCD will display the temperature.
7. Press the **T** button again to change the C/F unit of measure.
8. Press the  button to display moisture value again.

### Auto Power OFF

The meter can automatically turn itself off after several minutes. This is to conserve on battery energy. The user can select the period of time the meter must remain idle before turning itself off (1 through 9 minutes). The user can also elect to disable the automatic power off feature (select 00).

1. With the meter ON, simultaneously press the power and the right arrow buttons. The current time period will appear.
2. While continuing to hold the power button, use the right arrow button to select the desired time period. Select '00' to disable this feature.
3. Release both buttons when the desired value is on the LCD.

## Manual Accuracy Check

- There are two (2) sets of calibration poles located inside the meter's protective cover. One set is for the 18% calibration and the other is for the 26% calibration, as marked inside the cover.
- When checking the calibration, the A scale should be selected and the temperature probe must be disconnected.
- Touch the two measurement pins to the 18% calibration nodes and view the measurement on the meter display. Do the same for the 26% calibration.
- When correctly calibrated, the instrument will register %H<sub>2</sub>O values in the range of 17.7 to 18.3 (18% calibration) and in the range of 25.5 to 26.5 (26% calibration).
- If the tolerance exceeds  $\pm 1$  the instrument must be recalibrated.

## Care and Maintenance

When the instrument is not in use, keep it in its pouch together with its accessories. Store the kit in a stable, dust-free environment out of direct sunlight. Remove the batteries from the instrument if it is to be stored for periods of more than one month, or when the low battery power symbol appears on the display. Check the condition of accessories used with the instrument on a regular basis and replace them if they become worn or damaged.

## Battery replacement

When the low battery icon appears on the display, replace the battery as soon as practical.

1. Remove the rear battery compartment screw.
2. Remove the battery compartment door
3. Replace the two (2) 'AAA' 1'5V batteries
4. Replace the compartment door and secure the screw before using the meter.
- 5.



You, as the end user, are legally bound (**EU Battery ordinance**) to return all used batteries, **disposal in the household garbage is prohibited!** You can hand over your used batteries / accumulators at collection points in your community or wherever batteries / accumulators are sold!

**Disposal:** Follow the valid legal stipulations in respect of the disposal of the device at the end of its lifecycle

## Specifications

|                       |                                                   |
|-----------------------|---------------------------------------------------|
| Display               | Dual measurement scale LCD with bargraph metering |
| Measurement principle | Electrical resistance                             |
| Range                 | Wood: 6 to 44%                                    |
| Electrode length      | 8mm (0.3")                                        |
| Electrode pins        | Integrated, replaceable                           |
| Auto Power OFF        | After approx. 15 minutes                          |
| Power supply          | Two (2) 'AAA' 1'5V batteries                      |
| Meter housing         | Impact-proof plastic                              |
| Operating Temperature | 0 to 40°C (32 to 104°F)                           |
| Operating Humidity    | 85% Relative Humidity maximum                     |
| Dimensions            | 130 x 40 x 25mm (5.1 x 1.6 x 1.0")                |
| Weight                | 100g (3.5 oz)                                     |

## Calibration Tables for Wood

### Wood Species Group Tables

#### Common names of wood (BS-888 & 589:1973)

| Wood Species |           |            |      | Group |
|--------------|-----------|------------|------|-------|
| Abura        |           |            |      | E     |
| Afara        |           |            |      | A     |
| Aformosa     |           |            |      | G     |
| Afzelia      |           |            |      | E     |
| Agba         |           |            |      | J     |
| Amboyna      |           |            |      | G     |
| Ash,         | American  |            |      | B     |
| Ash,         | European  |            |      | A     |
| Ash,         | Japanese  |            |      | A     |
| Ayan         |           |            |      | C     |
| Baguacu,     | Brazilian |            |      | F     |
| Balsa        |           |            |      | A     |
| Banga        | Wanga     |            |      | A     |
| Basswood     |           |            |      | G     |
| Beech,       | European  |            |      | C     |
| Berlina      |           |            |      | B     |
| Binvang      |           |            |      | E     |
| Birch,       | European  |            |      | J     |
| Birch,       | Yellow    |            |      | A     |
| Bisselon     |           |            |      | E     |
| Bitterwood   |           |            |      | F     |
| Blackbutt    |           |            |      | C     |
| Bosquiea     |           |            |      | A     |
| Boxwood,     | Maracaibo |            |      | A     |
| Camphorwood, | E         | African    |      | C     |
| Canarium,    | African   |            |      | B     |
| Cedar,       | Japanese  |            |      | B     |
| Cedar,       | West      | Indian     |      | J     |
| Cedar,       | Western   | Red        |      | C     |
| Cherry,      | European  |            |      | J     |
| Chestnut     |           |            |      | C     |
| Coachwood    |           |            |      | G     |
| Cordia,      | American  | Light      |      | F     |
| Cypress,     | E         | African    |      | A     |
| Cypress,     | Japanese  | (8-18%mc)  |      | J     |
| Cypress,     | Japanese  | (18-28%mc) |      | C     |
| Dahoma       |           |            |      | A     |
| Danta        |           |            |      | C     |
| Douglas      | Fir       |            |      | B     |
| Elm,         | Japanese  | Grey       | Bark | B     |
| Elm,         | English   |            |      | E     |
| Elm,         | Rock      |            |      | E     |
| Elm,         | White     |            |      | E     |
| Empress,     | Tree      |            |      | J     |
| Erimado      |           |            |      | F     |
| Fir,         | Douglas   |            |      | B     |
| Fir,         | Grand     |            |      | A     |
| Fir,         | Noble     |            |      | J     |

| Wood Species |            |              |  | Group |
|--------------|------------|--------------|--|-------|
| Gegu,        | Nohor      |              |  | H     |
| Greenheart   |            |              |  | C     |
| Guarea,      | Black      |              |  | J     |
| Guarea,      | White      |              |  | H     |
| Gum,         | American   | Red          |  | A     |
| Gum,         | Saligna    |              |  | B     |
| Gum,         | Southern   |              |  | B     |
| Gum,         | Spotted    |              |  | A     |
| Gurjun       |            |              |  | A     |
| Hemlock,     | Western    |              |  | C     |
| Hiba         |            |              |  | J     |
| Hickory      |            |              |  | F     |
| Hyedunani    |            |              |  | B     |
| Iroko        |            |              |  | F     |
| Ironbank     |            |              |  | B     |
| Jarrah       |            |              |  | C     |
| Jelutong     |            |              |  | C     |
| Karpur       |            |              |  | A     |
| Karri        |            |              |  | A     |
| Kauri,       | New        | Zealand      |  | E     |
| Kauri,       | Queensland |              |  | J     |
| Keruing      |            |              |  | F     |
| Kuroka       |            |              |  | A     |
| Larch,       | European   |              |  | C     |
| Larch,       | Japanese   |              |  | C     |
| Larch,       | Western    |              |  | F     |
| Lime         |            |              |  | E     |
| Loliondo     |            |              |  | C     |
| Mahogany,    | African    |              |  | J     |
| Mahogany,    | West       | Indian       |  | B     |
| Makore       |            |              |  | B     |
| Mansoia      |            |              |  | B     |
| Maple,       | Pacific    |              |  | A     |
| Maple,       | Queensland |              |  | B     |
| Maple,       | Rock       |              |  | A     |
| Maple,       | Sugar      |              |  | A     |
| Matai        |            |              |  | E     |
| Meranti,     | Red        | (dark/light) |  | B     |
| Meranti,     | White      |              |  | B     |
| Merbau       |            |              |  | B     |
| Missanda     |            |              |  | C     |
| Muhuhi       |            |              |  | J     |
| Muninga      |            |              |  | G     |
| Musine       |            |              |  | J     |
| Musizi       |            |              |  | J     |
| Myrtle,      | Tasmanian  |              |  | A     |
| Naingon      |            |              |  | C     |
| Oak,         | American   | Red          |  | A     |
| Oak,         | American   | White        |  | A     |
| Oak,         | European   |              |  | A     |
| Oak,         | Japanese   |              |  | A     |
| Oak,         | Tasmanian  |              |  | C     |
| Oak,         | Turkey     |              |  | E     |

| Wood Species |             |            |       | Group |
|--------------|-------------|------------|-------|-------|
| Obeche       |             |            |       | G     |
| Odoko        |             |            |       | E     |
| Okwen        |             |            |       | B     |
| Olive,       | E           | African    |       | B     |
| Olivillo     |             |            |       | G     |
| Opepe        |             |            |       | H     |
| Padang       |             |            |       | A     |
| Padauk,      | African     |            |       | F     |
| Panga        | Panga       |            |       | A     |
| Persimmon    |             |            |       | G     |
| Pillarwood   |             |            |       | F     |
| Pine,        | American    | long       | leaf  | C     |
| Pine,        | American    | pitch      |       | C     |
| Pine,        | Bunya       |            |       | B     |
| Pine,        | Caribbean   | Pitch      |       | C     |
| Pine,        | Corsican    |            |       | C     |
| Pine,        | Hoop        |            |       | C     |
| Pine,        | Huon        |            |       | B     |
| Pine,        | Japanese    | Black      |       | B     |
| Pine,        | Kauri       |            |       | E     |
| Pine,        | Lodgepole   |            |       | A     |
| Pine,        | Maritime    |            |       | B     |
| Pine,        | New         | Zealand    | White | B     |
| Pine,        | Nicaraguan  | Pitch      |       | C     |
| Pine,        | Parana      |            |       | B     |
| Pine,        | Ponderosa   |            |       | C     |
| Pine,        | Radiata     |            |       | C     |
| Pine,        | Red         |            |       | B     |
| Pine,        | Scots       |            |       | A     |
| Pine,        | Sugar       |            |       | C     |
| Pine,        | Yellow      |            |       | A     |
| Poplar,      | Black       |            |       | A     |
| Pterygota,   | African     |            |       | A     |
| Pyinkado     |             |            |       | E     |
| Queensland   | Kauri       |            |       | J     |
| Queensland   | Walnut      |            |       | C     |
| Ramin        |             |            |       | G     |
| Redwood,     | Baltic      | (European) |       | A     |
| Redwood,     | Californian |            |       | B     |
| Rosewood,    | Indian      |            |       | A     |
| Rubberwood   |             |            |       | H     |
| Santa        | Maria       |            |       | H     |
| Sapele       |             |            |       | C     |
| Sen          |             |            |       | A     |
| Seraya,      | Red         |            |       | C     |
| Silky        | Oak,        | African    |       | C     |
| Silky        | Oak,        | Australian |       | C     |
| Spruce,      | Japanese    | (8-18%mc)  |       | J     |
| Spruce,      | Japanese    | (18-28%mc) |       | C     |
| Spruce,      | Norway      | (European) |       | C     |
| Spruce,      | Sitka       |            |       | C     |
| Stringybark, | Messmate    |            |       | C     |
| Stringybark, | Yellow      |            |       | C     |

| Wood Species |            |        |  | Group |
|--------------|------------|--------|--|-------|
| Sterculia,   | Brown      |        |  | A     |
| Sycamore     |            |        |  | F     |
| Tallowwood   |            |        |  | A     |
| Teak         |            |        |  | F     |
| Totara       |            |        |  | E     |
| Turpentine   |            |        |  | C     |
| Utile        |            |        |  | J     |
| Walnut,      | African    |        |  | J     |
| Walnut,      | American   |        |  | A     |
| Walnut,      | European   |        |  | C     |
| Walnut,      | New        | Guinea |  | B     |
| Walnut,      | Queensland |        |  | C     |
| Wawa         |            |        |  | G     |
| Wandoo       |            |        |  | J     |
| Whitewood    |            |        |  | C     |
| Yew          |            |        |  | C     |

## Botanical Names of Wood

| Wood Type       |                | Grp             |
|-----------------|----------------|-----------------|
| Abies           | alba           | B               |
| Abies           | grandis        | A               |
| Abies           | procera        | J               |
| Acanthopanax    | ricinifolius   | A               |
| Acer            | macrophyllum   | A               |
| Acer            | pseudoplatanus | F               |
| Acer            | saccharum      | A               |
| Aetoxicon       | punctatum      | G               |
| Aformosia       | elata          | G               |
| Afaelia         | spp            | E               |
| Agathis         | australis      | E               |
| Agathis         | palmerstoni    | J               |
| Agathis         | robusta        | J               |
| Amblygonocarpus | andgensis      | A               |
| Amblygonocarpus | obtusungulis   | A               |
| Araucaria       | angustifolia   | B               |
| Araucaria       | bidwilli       | B               |
| Araucaria       | cunninghamii   |                 |
| Berlinia        | grandiflora    | B               |
| Berlinia        | spp            | B               |
| Betula          | alba           | J               |
| Betula          | alleghaniensis | J               |
| Betula          | pendula        | J               |
| Betula          | spp            | J               |
| Bosquiera       | phoberos       | A               |
| Brachylaena     | hutchinsii     | J               |
| Brachylaena     | spp            | B               |
| Calophyllum     | brasiliense    | H               |
| Canarium        | schweinfurthii | B               |
| Cardwellia      | sublimes       | C               |
| Carya           | glabra         | F               |
| Cassipourea     | elliottii      | F               |
| Cassipourea     | melanosana     | F               |
| Castanea        | sativa         | C               |
| Cedrea          | odorata        | J               |
| Ceratopetalum   | apetala        | G               |
| Chamaecyparis   | spp            | (8-18%mc)<br>G  |
| Chamaecyparis   | spp            | (18-28%mc)<br>C |
| Chlorophora     | excelsa        | F               |
| Cordial         | alliodora      | F               |
| Corton          | megalocarpus   | J               |
| Cryptomelia     | japonica       | B               |
| Cupressus       | spp            | A               |
| Dacryium        | franklinii     | B               |
| Dalbergia       | latifolia      | A               |
| Diospyros       | virginiana     | G               |
| Dipterocarpus   | (Keruing)      | F               |
| Dipterocarpus   | zeylanicus     | A               |
| Distemonanthus  | benthamianus   | C               |
| Dracontomelum   | mangiferum     | B               |
| Dryobalanops    | spp            | A               |
| Dyera           | costulata      | C               |

| Wood Type        |              | Grp |
|------------------|--------------|-----|
| Entandrophragma  | angolense    | H   |
| Entandrophragma  | cylindricum  | C   |
| Entandrophragma  | utile        | J   |
| Endiandra        | palmerstoni  | C   |
| Erythrophleum    | spp          | C   |
| Eucalyptus       | acmenicides  | C   |
| Eucalyptus       | crebra       | B   |
| Eucalyptus       | diversicolor | A   |
| Eucalyptus       | globules     | B   |
| Eucalyptus       | maculate     | A   |
| Eucalyptus       | marginata    | C   |
| Eucalyptus       | microcorys   | A   |
| Eucalyptus       | obliqua      | C   |
| Eucalyptus       | pilularis    | C   |
| Eucalyptus       | saligna      | B   |
| Eucalyptus       | wandoo       | J   |
| Fagus            | sylvatica    | C   |
| Flindersia       | brayleyana   | B   |
| Fraxinus         | Americana    | B   |
| Fraxinus         | excelsior    | A   |
| Fraxinus         | japonicus    | A   |
| Fraxinus         | mardshurica  | A   |
| Gonystylus       | macrophyllum | G   |
| Gossweilodendron | balsamiferum | J   |
| Gossypiospermum  | proerox      | A   |
| Grevillea        | robusta      | C   |
| Guarea           | cedrata      | H   |
| Guarea           | thomsonii    | J   |
| Guibortia        | ehie         | B   |
| Hevea            | barsilensis  | H   |
| Intsia           | bijuga       | B   |
| Juglans          | nigra        | A   |
| Juglans          | regia        | C   |
| Khaya            | senegalensis | E   |
| Khaya            | ivorensis    | J   |
| Larix            | deciduas     | C   |
| Larix            | kaempferi    | C   |
| Larix            | leptolepis   | C   |
| Larix            | occidentalis | F   |
| Liquidamper      | styraciflua  | A   |
| Lovoa            | klaineana    | J   |
| Lovoa            | trichiloides | J   |
| Maesopsis        | eminii       | J   |
| Mansonia         | altissima    | B   |
| Millettia        | stuhimannii  | A   |
| Mimusops         | heckelii     | B   |
| Mitragyna        | ciliate      | E   |
| Nauclea          | diderrichii  | H   |
| Nesogordonia     | papaverifera | C   |
| Nothofagus       | cunninghamii | A   |
| Ochroma          | lagopus      | A   |
| Ochroma          | pyramidalis  | A   |
| Ocotea           | rodiaei      | C   |

| Wood Type      |              | Grp             |
|----------------|--------------|-----------------|
| Ocotea         | usambarensis | C               |
| Octomeles      | sumatrana    | E               |
| Olea           | hochstetteri | B               |
| Olea           | welwitschii  | C               |
| Palaquium      | spp          | A               |
| Paulownia      | tomentosa    | J               |
| Pericopsis     | elata        | G               |
| Picea          | abies        | C               |
| Picea          | jezoensis    | (8-18%mc)<br>J  |
| Picea          | jezoensis    | (18-28%mc)<br>C |
| Picea          | sitchensis   | C               |
| Picaenia       | excelsa      | C               |
| Pinus          | caribaea     | C               |
| Pinus          | contorta     | A               |
| Pinus          | lambertiana  | C               |
| Pinus          | nigra        | C               |
| Pinus          | palustris    | C               |
| Pinus          | pinaster     | B               |
| Pinus          | ponderosa    | C               |
| Pinus          | radiata      | C               |
| Pinus          | spp          | B               |
| Pinus          | strobus      | A               |
| Pinus          | sylvestris   | A               |
| Pinus          | thunbergii   | B               |
| Pipadeniastrum | africanum    | A               |
| Piptadenia     | africana     | A               |
| Podocarpus     | dacrydiodes  | B               |
| Podocarpus     | spicatus     | C               |
| Podocarpus     | totara       | E               |
| Populus        | spp          | A               |
| Prunus         | avium        | J               |
| Pseudotsuga    | menzesii     | B               |
| Pterocarpus    | angolensis   | G               |
| Pterocarpus    | indicus      | G               |
| Pterocarpus    | soyauxii     | F               |
| Pterygota      | bequaertii   | A               |
| Quercus        | cerris       | E               |
| Quercus        | delegatensis | C               |
| Quercus        | gigantea     | C               |
| Quercus        | robur        | A               |
| Quercus        | spp          | A               |
| Ricinodendron  | heudelottii  | F               |
| Sarcocephalus  | diderrichii  | H               |
| Scottellia     | coriacea     | E               |
| Sequoia        | sempervirens | B               |
| Shorea         | smithiana    | G               |
| Shorea         | spp          | B               |
| Sterculia      | rhinopetala  | A               |
| Swietenia      | candollei    | A               |
| Swietenia      | mahogani     | B               |
| Syncarpia      | glomulifera  | C               |
| Syncarpia      | laurifolia   | C               |
| Tarrietia      | utilis       | C               |

| Wood Type    |               | Grp |
|--------------|---------------|-----|
| Taxus        | baccata       | C   |
| Tectona      | grandis       | F   |
| Terminalia   | superba       | A   |
| Thuja        | plicata       | C   |
| Tujopsis     | dolabrat      | J   |
| Tieghamella  | heckelii      | B   |
| Tilia        | americana     | G   |
| Tilia        | vulgaris      | E   |
| Triploehiton | scleroxylon   | G   |
| Tsuga        | heterophylla  | C   |
| Ulmus        | americana     | E   |
| Ulmus        | procea        | E   |
| Ulmus        | thomasii      | E   |
| Xylia        | dolabriformis | E   |
| Zelkova      | serrata       | B   |

## NOTES:

- The calibration data in this table are based on standard tests by oven-drying of commercial samples of the various wood species, between 7% and fibre saturation. Above the fibre saturation point (25%-30%) readings are approximate and generally apply to wood that has been dried and re-wetted.
- The instrument is calibrated for wood at 68°F (20°C). If the temperature of wood varies by more than 5°C, the meter reading can be corrected approximately by adding 1/2% for every 9F (5°C) below 68°F (20°C) or subtracting 1/2% for every 9F (5°C) above 68°F (20°C).
- Readings higher by 1%-2% may be obtained where wood has been impregnated with a water-borne preservative.
- High readings obtained with some ply-woods of peculiar composition must be treated with caution.
- Building material measurements: Select the 'A' scale to measure building materials. Refer to the following conversion table to obtain the building material moisture value.

- Building material and chip-board measurements: Select the 'A' scale to measure building materials and chip-board. Refer to the following conversion table to obtain the building material and chip-board moisture value equivalents.

| Std<br>Scale<br>A | Bldg<br>Mat'l | Species Group |      |      |      |      |      |      | Chip-<br>board |
|-------------------|---------------|---------------|------|------|------|------|------|------|----------------|
|                   |               | B             | C    | E    | F    | G    | H    | J    |                |
| %H2O              |               |               |      |      |      |      |      |      |                |
| 6                 | 3             |               |      |      |      |      |      |      |                |
| 7                 | 4.8           | 9.2           | 9.4  | 8.6  | 6.8  | 6.7  | 11.0 | 10.1 |                |
| 8                 | 7.0           | 10.0          | 10.3 | 9.3  | 7.4  | 7.4  | 11.5 | 11.0 |                |
| 9                 | 8.7           | 10.8          | 10.9 | 9.7  | 7.9  | 8.1  | 12.1 | 11.6 | 8.5            |
| 10                | 10.5          | 11.7          | 11.5 | 10.4 | 8.6  | 8.8  | 12.7 | 12.2 | 9.4            |
| 11                | 12.2          | 12.7          | 12.6 | 11.3 | 9.5  | 9.7  | 13.4 | 13.4 | 10.5           |
| 12                | 13.3          | 13.6          | 13.7 | 12.1 | 10.5 | 10.5 | 14.0 | 14.3 | 11.5           |
| 13                | 14.8          | 14.5          | 14.5 | 12.7 | 11.2 | 11.2 | 14.5 | 15.1 | 12.5           |
| 14                | 16.2          | 15.3          | 15.5 | 13.4 | 11.8 | 11.8 | 15.0 | 16.0 | 13.5           |
| 15                | 16.6          | 16.3          | 16.7 | 14.1 | 12.5 | 12.6 | 15.6 | 17.0 | 14.4           |
| 16                | 17.2          | 16.9          | 17.5 | 14.8 | 13.0 | 13.2 | 16.0 | 17.7 | 14.9           |
| 17                | 18.8          | 17.7          | 18.8 | 15.7 | 14.3 | 13.9 | 16.6 | 18.5 | 15.3           |
| 18                | 19.6          | 18.2          | 19.7 | 16.3 | 15.0 | 14.5 | 17.0 | 19.1 | 16.1           |
| 19                | 20.2          | 19.0          | 21.0 | 16.9 | 15.9 | 15.2 | 17.6 | 20.0 | 16.7           |
| 20                | 20.6          | 20.0          | 22.6 | 17.8 | 16.9 | 16.1 | 18.4 | 21.3 | 17.2           |
| 21                | 20.9          | 20.8          | 23.5 | 18.5 | 17.6 | 16.8 | 19.1 | 22.3 | 18.3           |
| 22                | 21.5          | 21.5          | 24.5 | 29.3 | 18.3 | 17.4 | 19.7 | 23.2 | 19.1           |
| 23                | 22.1          | 22.9          | 26.4 | 20.2 | 19.8 | 18.6 | 21.2 | 24.5 | 19.9           |
| 24                | 22.7          | 23.5          | 27.4 | 20.8 | 20.4 | 19.0 | 22.0 | 25.8 | 20.5           |
| 25                | 23.2          | 24.2          | 27.8 | 21.2 | 21.0 | 19.4 | 22.7 | 26.3 | 23             |
| 26                | 23.6          | 25.3          | 29.0 | 22.4 | 22.3 | 20.1 | 23.9 | 27.3 |                |
| 27                | 24.0          | 26.6          | 30.0 | 23.3 | 23.5 | 20.8 | 24.9 | 28.2 |                |
| 28                | 24.2          | 27.9          | 31.2 | 24.2 | 24.6 | 21.6 | 25.7 | 29.2 |                |
| 29                | 24.4          | 29.3          | 32.5 | 25.6 | 26.0 | 22.9 | 26.9 | 30.2 |                |
| 30                | 24.6          | 30.8          | 33.7 | 26.8 | 27.5 | 24.1 | 28.2 | 31.1 |                |
| 32                | 25.0          |               |      |      |      |      |      |      |                |
| 37                | 25.8          |               |      |      |      |      |      |      |                |
| 39                | 26.1          |               |      |      |      |      |      |      |                |
| 40                | 27.2          |               |      |      |      |      |      |      |                |
| 46.5              | 33.0          |               |      |      | 1    |      |      |      |                |