



JR TECHNOLOGY
LIMITED

REINFORCED PLASTICS & COMPOSITES
PRODUCTION ENGINEERS

M49 MOISTURE MONITOR

FEATURES

- No prongs, probes or electric contacts
- Clear digital read out with direct reading (no charts/tables)
- Pocket size, one handed operation
- Measures all non conductive materials with an electromagnetic field
- The Display has a Hold Facility incorporated with the ON/OFF switch
- Three material density selector & calibration facility

M49 SPECIFICATION

- Size & Weight: 45 x 70 x 110 mm, 200 grms (with battery - 1 PP6)
- Range of moisture measurement: 0-20% by weight
- Resolution: 1/100 of 1%
- Linearity: $\pm 2\%$ of permittivity measurement
- Accuracy: $\pm 0.1\%$ of FSD, ± 1 count, + dielectric ration error, + temp variation
- Dielectric Ratio Error
Below 3% Moisture: Corrected to better than 1/2 the ratio of dielectric constants of water & material under investigation
Above 3% Moisture: Corrected to better than 1/10 of the ratio of dielectric constants of water & the material under investigation
- Temperature Range: 0°C - 70°C
- Temperature Variation: Better than 0.02%/°C

OPERATION

The meter is placed against the surface to be measured and the ON/OFF switch moved to the right position. The reading on the display will remain for a period of 10 seconds. The meter will then automatically return to its normal measurement mode and the switch can be returned to the ON position ready for further use.



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OPERATION OF:
M49 MOISTURE MONITOR

GENERAL

Any new method of measuring moisture will require new techniques & this is true of the M49. The method of detection used in this instrument is a far better indicator of true moisture than methods the operator may have used in the past & these notes will help to avoid any confusion.

The true measurement of moisture has always been difficult to make & all of the traditional methods which have given acceptable accuracy have either been: prohibitively expensive, extremely complex, require heavy / bulky equipment or only suitable for use in the scientific laboratory.

As a result & in order to produce inexpensive portable instruments, 'rough & ready' indicating devices have been produced which utilise various parametric techniques in simple, hand held instruments. These use a parameter which changes when a material gets wet, such as: colour, hardness, electrical resistance, thermal conductivity etc. They have the disadvantage that numerous charts or scales are necessary to show how the parameter varies with dampness in various situations & materials. While they can give acceptable results, under some conditions they can give highly erroneous readings, which can cause a false impression to be given.

The M49 is a true moisture measuring instrument in a hand held unit. It measures the dielectric constant of the material under test & as the dielectric constant of water is many times higher than any of the materials which normally contain water, this device gives a certain indication that true moisture is present. Previous instruments using this technique were too large & bulky to be carried easily. The M49 produces a high frequency electric (electro-magnetic) field, which penetrates the material investigated & measures the average amount of water within this field.

FEATURES

- No prongs, probes or electric contacts
- Clear digital read out with direct reading (no charts/tables)
- Pocket size, one handed operation
- Measures all materials with a deep penetrating electric field
- The DISPLAY HOLD facility makes it easier to use the meter in inaccessible places & is combined with the ON/OFF switch on the instrument panel



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OPERATION

(1). ZERO ADJUSTMENT SCREW:

After long periods of use, should the zero of the instrument become incorrect this may be adjusted by means of the zero adjustment screw. This is located on the base of the case near to the battery compartment & is accessible through a small hole in the case. The adjustment should be done with a non-metallic screwdriver keeping hands away from the sensitive end of the instrument.

Since the instrument is very sensitive to moisture within its field, changes in the relative humidity of the surroundings may cause an error in readings of one or two digits. This represents only one or two hundredths of one percent & it is not necessary in this case to adjust the zero, since the zero will return to its original setting when the humidity changes, & in most applications this will not interfere with the accuracy of the instrument.

(2). BATTERY LOW INDICATOR:

When the battery is coming to the end of its useful life, an arrow will appear on the left-hand side of the display, pointing to the words 'LO BAT' printed on the panel of the instrument.

(3). DENSITY SWITCH:

To increase the accuracy for a range of materials with different densities, the density switch has three positions: high, medium & low.

- HIGH DENSITY RANGE is suitable for: brick, stone & most building materials
- MEDIUM DENSITY RANGE is suitable for materials containing air such as: wood, paper, breeze block walls, etc.
- LOW DENSITY RANGE is suitable for materials containing considerable amounts of air such as: some softwoods, grain, granules, powders & many foodstuffs. This range is also useful for plastics, which contain low quantities of water & also for where an air gap exists across which the measurement must be made.

(4). DISPLAY LOCK & ON/OFF SWITCH:

The DISPLAY LOCK function is included with the ON/OFF switch on the panel of the meter. The ON/OFF switch has three positions. In addition to the ON & OFF function by sliding the switch to the extreme right hand position, the display can be locked for a period of approximately 10 seconds, making it easier to use the meter in inaccessible places or near to the ground.

To operate the DISPLAY LOCK mode, the instrument should be placed against the surface to be measured in the usual way & the ON/OFF switch moved to the DISPLAY LOCK position. The reading on the display at this time will remain for a period sufficient for the meter to be removed & read at a more



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convenient position. After 10 seconds the meter will return to its normal measurement mode and the switch should be returned to the normal 'ON' position, ready for any further use. As soon as the switch is placed in the normal 'ON' position the DISPLAY LOCK is ready for further use.

(5). OVERLOAD WARNING:

This applies to moisture levels of 20% or over & is indicated on the display by all of the numbers becoming blank & a number '1' appearing on the left side of the screen.



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USE OF THE M49 FOR INDUSTRIAL MOISTURE MEASUREMENTS

The cause of dampness can be indicated by the way the moisture varies in a structure or material & as the M49 is a non-destructive instrument & does not need holes for prongs, any number of measurements can be taken to determine the way in which moisture varies throughout a material.

Difficulty can arise in the measurement of some industrial materials, which are soft or compressible as the M49 measures all of the moisture within its field any additional material, which can be compressed into its field will carry additional moisture, therefore carrying a higher reading. If the instrument is to be used with such materials the pressure applied must be constant & repeatable if the optimum accuracy is to be attained.

The operator must also bear in mind that it is not always possible to exclude the effects of the material under test. The main cause of error when using the dielectric measuring system is by materials having a dielectric constant comparable with that of water, such as: metals, ferrites, carbon fibre, etc. Any item containing these components is likely to give higher readings than expected & therefore it is important to consider this when analysing results.



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COMPARISON BETWEEN:
M49 & OTHER TYPES OF PORTABLE, NON-DESTRUCTIVE, ELECTRICAL,
MOISTURE METERS

Of all the methods possible for the measurement of moisture, by far the most popular has been that of using electrical conductivity, due to simplicity & low cost. It is interesting to compare the results obtained in some common situations between this type of instrument & the M49:-

- For instance where moisture is in a thin layer, such as occurs with temporary condensation on an otherwise dry wall, instruments using surface electrical conductivity will indicate a damp or even saturated wall even though the wall is dry. However, this layer is only in a small part of the field of the M49, therefore it will give a low reading due to the penetration of the field into the dry wall behind.

- Another example is where a damp or saturated wall is covered with a thin waterproof sealant, the surface conductivity will indicate a dry wall, whereas the M49 will indicate the damp below this sealer.

In both these cases the results obtained by the two instruments are quite dissimilar & the conductivity type of instrument indicates the opposite to the true conditions. However, there are also many cases in which the two types of instrument produce similar readings.

It is something of a surprise to many technicians to discover the true moisture present, which may be quite different from what appeared to be the case when measurements were based on electrical conductivity. Water will conduct only if it contains salts or other chemical impurities, consequently any electrical conductivity is a result of the impurities present & only indirectly of the water itself. This leads to the impression that the amount of water present follows a pattern, which may be quite different from the true conditions. All walls contain moisture, even when they are considered to be quite dry, & under these conditions the electrical conductivity may be practically zero.

Perhaps the greatest difference in the two types of measurement, is lack of the necessity for any special scales when using the improved dielectric method. There is no need for tables or charts listing the way in which the electrical conductivity varies in different materials & circumstances. Also, it is not necessary to include several scales on the instrument for the interpretation of the results to correlate under what conditions & in what materials the moisture content will affect the electrical conductivity.

