Innovative Microwave Resonance Technology

Process and Laboratory Moisture Measuring
Dear Customer,

I am happy to introduce to you our new generation of TEWS microwave moisture measuring instruments. These measuring instruments, named as „Blueline®“, are the fourth generation of our moisture meters developed at our Hamburg location. The „Blueline®“ series are distinguished by their entirely new electronics and intuition-operated software. They are combined with the provision of a complete set of established interfaces such as USB, Ethernet and Profibus.

I started the company with a handful of employees at the end of the 1970s to manufacture computing technology. By the end of the 1980s, TEWS Elektronik started to revolutionize the moisture measuring technology. The MW2300 was the first moisture meter to work independently of product densities, using our patented „TEWS method“.

TEWS Elektronik - combining tradition with innovation to give the meaning of a modern Hamburg company of the 21st century.

Manfred Tews
Measuring Moisture by Microwave Resonance

The Patented „TEWS Method“

**Moisture**

Moisture is defined as the percentage of water contained in the total mass of a solid substance. Other terms are used synonymously - such as humidity, material moisture, absolute moisture, moisture content, gravimetric water content etc., these words must be clearly distinguished from all expressions referring to the share of steam in gases such as humidity, relative humidity, water vapor content etc. The ATRO moisture details only refers to the water content in the dry mass of the substance.

**Water molecules and resonant microwave field**

Water molecules residing on the surface or in the pores of solid substances align themselves with electromagnetic fields while drawing energy from the field. One practical example of using this effect is a microwave oven where oscillating water molecules generate heat. The interaction between microwavefields and water molecules are also measured and, thus, put to technical use. Since microwaves will penetrate deeply into the product, the technique will detect water both inside and on the surface of an object or substance.

**Microwave resonance**

The TEWS moisture measuring method uses a sensor to generate a low-powered microwave field resonating characteristically within well-defined parameters. Filling or covering the sensor with a product – e.g. a powder or granules – will change the position and strength of the resonance. These changes largely depend on how much water the product contains. The resonance readings are proportional to moisture. The effects of the product density variations or sensor load are compensated for. The TEWS’ method allows several dozen, or even several thousand, readings to be taken and shown every second.
For the moisture content to be shown as a percentage, the instrument first needs to be calibrated. This is done by collecting samples of the product with different moisture contents, which cover a typical range of applications. Moisture in the sample is then measured using both a suitable laboratory method and the microwave resonance method. In the drying process (drying kiln, drying balance), the sample moisture is determined mainly by the amount of weight lost. A chemical method, such as the Karl Fischer titration, can also be applied occasionally to determine the water content.

The system uses the pairs of values obtained from the microwave and laboratory measurements to calculate a calibration curve, which is then used to convert the measured microwave readings into moisture percentages. Under certain circumstances, the instruments can also be calibrated for measuring densities. Calibration is required only once for every product.

**Example of a calibration graph**

Number of samples measured: 9, Correlation: 0.99, Mean deviation: +/- 0.1%, Lab reference method: drying kiln

**MEASURING METHOD BENEFITS:**

- Very fast results, also suitable for measuring online
- High accuracy of results
- Measuring independent of product density or product load
- No impact of optical factors on measuring, such as color changes, product surface structure, dust
- Measuring of moisture at product surface and core
- Non-destructive measuring
- No consumables, such as reagents, etc.
- Testers are maintenance-free and easy to use
At TEWS, customer services play a crucial role. Although our products and procedures operate at the highest levels of reliability and process safety, requirements are constantly becoming more demanding. TEWS is committed to customer satisfaction and our services with its long-term business relationships are focused on application support, service, training and spare parts.

**Expert Service**

**Expert answers are always available**

Our technical telephone support specialists will give you all the application support you need to optimize your processes and operate the TEWS devices.

Our support team is there for you - no need to dial in to an expensive service number. Get immediate and individual support with your technical inquiry.

**Fast and at minimum cost**

Clear-cut fault diagnosis and perfect troubleshooting allow us to make repairs extremely quickly. Our factory will take 1-5 working days to complete a normal repair.

**WHAT WE CAN DO FOR YOU:**

- Express service; generally, repairs can be done within a few working days
- Retrofitting of optional add-ons
- Hardware and software upgrades/updates
- Backup of your customer-specific configuration data
- Warranty for any repairs made
- Repairs report upon request
- Cost estimates upon request
- Support via telephone, email and remote access via Internet or modem

**YOUR BENEFITS:**

- Configuration by qualified engineer
- Expert compilation of device parameter settings
- Acceptance and logging
- Storing parameter files on your PC using the software TEWS Moisture View ©
- Instructions and training for your employees
- Free test equipment available

**So that everything is smooth sailing**

TEWS products always conform to the latest industry standards and integrate perfectly into existing facilities. As a special service, we offer our support with commissioning and to optimize your system to be the most cost-effective possible.

**The productivity of your system matters**

To enhance productivity, we work closely in a partnership with our customers to determine together which practical programs of machine and system maintenance are required and reasonable.

Everything we do will be accurately tailored to meet your needs – a true partnership.

During maintenance intervals ask us about a B-type acceptance test certificate for your complete moisture measuring chain in conformity with EN 10204.

Contact our hardware and software upgrade/update service team.
Our Service

Global Support

YOUR BENEFITS:

- Optimum instrument availability between maintenance intervals
- Maintenance report including all logs relevant to quality
- Assistance for your own service technicians
- Minimized downtimes
- Free testing equipment

WHAT WE CAN DO FOR YOU:

- Configuration of new devices according to your requirements
- Assistance in defining your requirements and product selection
- Optional preconfiguration for fast user-site setup
- Preparation of customized wiring diagrams
- Documentation of the configuration
- Optimum adaptation to your task
- Utilization of all options available from your TEWS product
- Cost effective since the user is not required to handle configuration details
- If needed, we will transfer the configuration from the old to the new instrument

Perfect adaptation to your process

Our technical support specialists will answer all your questions concerning commissioning and starting up, optimizing and operating your TEWS products. They will also help you find the causes of any problems you may encounter. Remote access via Internet or GSM-Modem can also be made from our location. Submit your questions and inquiries to:

info@tews-elektronik.com
(service options, applications, measuring instruments, etc.)

service@tews-elektronik.com
(maintenance, configuration, calibration, etc.)

This is always available. That’s why we hold a comprehensive system of approximately 2,000 different parts in stock for you.

TEWS spare parts service is fast and reliable: 80 percent of all orders are processed within three working days. Express orders will be delivered within 24 hours.

Know-how: Walking off the beaten track may be the best way of getting ahead of competition. This will take vision, increased knowledge and optimized processes.

Rely on TEWS to obtain that cutting edge. Use our know-how and years of experience!

Your direct line to our technical support

Your equipment availability matters

TEWS Consulting gives you a competitive edge
Measuring the Moisture in Foods and Feedstuffs

Fast and accurate Measuring to save you Time and Money

The amount of water contained in foods and primary products is vital to quality, processing and durability. The legal requirements concerning food products also need to be taken into account. Ensuring the correct product moisture at all stages of the manufacturing process requires continuously measuring the actual product or samples of it. Conventional moisture measuring involves a drying kiln or a drying balance - which often demand some preparation of samples and will always impose some delay before a result is obtained: a couple of minutes if all goes well or frequently several hours.

Moisture meters supplied by TEWS Elektronik provide you with immediate results. Extremely fast results and simple operation of the measuring instrument save you considerable time. All TEWS’ laboratory systems and process systems are simple to operate and almost entirely maintenance-free.

Results obtained with the microwave resonance method of moisture measuring are not influenced by the density, height of pile or color of the product analyzed. Therefore, natural variations in the grain size, color, mineral content, etc. especially of grains, oilseeds and products made from primary produce, will not affect results. Another problem with conventional laboratory measuring is that samples need to be precisely weighed. Process systems benefit from the sensor value being unaffected by the amount of product on the sensor or by varying grain sizes. A broad range of laboratory sensors also enables moisture measuring of many different products, even with large-size particles, in their original shape and form without grinding or any other preparation.

Microwave measuring will detect the moisture at both the surface and core of the product. This gives them an advantage when measuring those difficult products which, for example, may be dried at the surface only. Both drying processes and optical measuring methods will find it difficult to measure those products.

PRACTICAL EXAMPLES:

<table>
<thead>
<tr>
<th>Product</th>
<th>Moisture Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat flour</td>
<td>5 – 13%</td>
</tr>
<tr>
<td>Sugar</td>
<td>0.1 – 0.4%</td>
</tr>
<tr>
<td>Banana chips</td>
<td>1.6 – 3%</td>
</tr>
<tr>
<td>Soybeans</td>
<td>8 – 13%</td>
</tr>
<tr>
<td>Rapeseed</td>
<td>5 – 13%</td>
</tr>
<tr>
<td>Pasta</td>
<td>5 – 16%</td>
</tr>
<tr>
<td>Chives</td>
<td>1 – 7.5%</td>
</tr>
<tr>
<td>Almonds</td>
<td>5 – 10%</td>
</tr>
<tr>
<td>Marzipan</td>
<td>7 – 16%</td>
</tr>
<tr>
<td>Hops</td>
<td>7 – 16%</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>6 – 14%</td>
</tr>
<tr>
<td>Pet food</td>
<td>6 – 16%</td>
</tr>
</tbody>
</table>
Measuring the Moisture in Coffee

From whole Beans to Powder

Coffee is one of the most popular beverages. Knowing the moisture content at various stages of coffee production is one of the keys to quality and cost control.

Since coffee beans are traded by weight, the water content in this product is a particularly important cost element. Sellers will try to supply best quality but, at the same time, ensure they go up to the admissible moisture limit. Moreover, many countries, such as Germany, levy a special coffee tax, so knowing the moisture content at as many stages of production as possible is another way of reducing costs. Increasing moisture by as little as half a percent can help to considerably increase a company earnings.

Another important aspect is the fact that, in many countries, consumer protection legislation limits the water content in the finished product to 5% and, therefore, the manufacturer undertakes measures not to exceed this limit. The use of TEWS microwave moisture measuring can provide efficient assurance that the water content limits are adhered to with high accuracy at many stages of coffee processing. One prime example is green coffee which should contain no more than 13% water to safely exclude the risk of fermentation starting during storage or transit.

**Economic aspects**

**Quality**

Knowing the exact water content of their coffee helps companies to comply with legal regulations while optimizing production - meeting both their objectives of ensuring a high quality level and maximizing profitability.

**BENEFITS:**

- Highly accurate measuring system for laboratory use and process control
- Simultaneous measuring of moisture and bulk density
- Volume moisture measuring regardless of color, even of freshly roasted whole beans

<table>
<thead>
<tr>
<th>Product</th>
<th>Moisture Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product</strong></td>
<td><strong>Moisture Range</strong></td>
</tr>
<tr>
<td>Green coffee</td>
<td>laboratory and process</td>
</tr>
<tr>
<td>Roasted coffee</td>
<td>laboratory and process</td>
</tr>
<tr>
<td>Ground coffee</td>
<td>density measurement</td>
</tr>
<tr>
<td>Instant coffee</td>
<td>laboratory and process</td>
</tr>
<tr>
<td>Instant drink powder</td>
<td>laboratory and process</td>
</tr>
</tbody>
</table>
Measuring the Moisture and Density of Tobacco

Moisture Levels precisely calculated

Applications

Many cigarette and cigar factories in Europe, Africa, America and Asia successfully deploy our devices for measuring the moisture in leaf tobacco, cut tobacco, stems, cigarettes or cigars.

Measuring systems

Our range of instruments includes portable testers, systems for laboratory use and process control, as well as special solutions for the measuring of moisture and weight distribution in separate cigarettes.

EXAMPLES OF PLANAR SENSORS USED FOR TOBACCO PROCESSING:

<table>
<thead>
<tr>
<th>Step</th>
<th>Tobacco</th>
<th>Moisture range</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCC drum entry or exit</td>
<td>Leaf tobacco</td>
<td>7 – 25%</td>
</tr>
<tr>
<td>After Burley toaster</td>
<td>Leaves</td>
<td>16 – 24%</td>
</tr>
<tr>
<td>After dryer</td>
<td>Leaves or cut, all types and blends</td>
<td>11 – 16%</td>
</tr>
<tr>
<td>After separator</td>
<td>Cut stems or leaves</td>
<td>18 – 35%</td>
</tr>
<tr>
<td>After expansion / reorder drum</td>
<td>Expanded cut</td>
<td>5 – 17%</td>
</tr>
<tr>
<td>After casing drum / top-flavor drum</td>
<td>Cut, final blends</td>
<td>11 – 18%</td>
</tr>
</tbody>
</table>

MOISTURE CALIBRATION:

Updated instrument calibration is invariably available to produce highly accurate results for each type and brand of cigarette.

MW 1100
MW 1100S

Portable tester MW 1100 and lance probe MW 1100S are designed for fast and easy moisture measuring in leaf tobacco and cuts.

MW 4300
MW 4310

The systems for laboratory or atline use meet the highest standards of quality assurance with respect to routine manual tests using special sensors to measure, for example, green leaf, cut tobacco or stem and can measure moisture and tobacco weight for each individual cigarette or cigar.

MW 1150

Easy-to-use laboratory instrument optimized for fast and accurate routine tests.

MW 3011

Systems of type MW 3011 feature cigarette rod sensors and a very fast electronics. They can be installed in cigarette or cigar making machines to measure tobacco weight for weight monitoring.

MW 4420

Testing station for measuring and analyzing the moisture and density profiles of cigarettes, including a system for suggesting improved settings of the cutter in the cigarette making machine.

MW 4430

Testing station for the measuring of cigar moisture and density profiles.
Measuring the Moisture in Pharmaceuticals and Chemicals

Meeting the Demand for 100% Verification

It is easy to understand why no other business puts as much stress on the quality of products, raw materials and processes as the pharmaceutical industry. When it comes to precision and speed, measuring must meet the very highest standards.

**Powder drying and granulation**

Moisture readings play a crucial role in processes such as powder drying and granulation. Drying is best controlled if accurate sensor values are always available. You may, for example, wish to measure the moisture as the material is inserted in a spray dryer. Taking continuous readings can help you determine when the process has achieved its target moisture. Thus, control drying and granulation can be monitored.

**Hard gelatine capsules**

The properties of hard gelatine capsules depend on moisture to a very high degree. Prior to automatic filling, the capsules need to be conditioned to attain a specific moisture level to ensure their physical properties are optimized.

Moisture content can be measured online in the dryer in order to verify whether the capsule moisture is met for further processing. Automatic sampling is carried out in a bypass system to monitor the hard gelatine capsules. The moisture in the pressed powder could also be measured when the tablet is inserted in the pressing machine.

**100% inspection of tablets and capsules**

As the production of pharmaceuticals has a tendency to increase continuous production control and documentation, there is a constant growing demand for 100% monitoring of all the weight in tablets produced and filled capsules. The weights cannot be monitored 100% by using balances at the speed of modern production lines.

The TEWS Elektronik MW 3011 microwave instrument returns 10,000 moisture and mass readings every second, therefore making it the perfect tool for the high-speed separate measurement of rapidly passing tablets and capsules. The number of objects measured per unit of time is limited solely by the speed at which the objects are passed through the sensor - not by the measuring frequency. Microwave resonance sensors can be installed directly into the production machine or can operate in separate inspection equipment.

**PRACTICAL EXAMPLES:**

<table>
<thead>
<tr>
<th>Product</th>
<th>Moisture Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gelatine capsules</td>
<td>laboratory and process</td>
</tr>
<tr>
<td>Vitamin powder</td>
<td>laboratory</td>
</tr>
<tr>
<td>Granules</td>
<td>for making tablets</td>
</tr>
<tr>
<td>Calcium ammonium nitrate (fertilizer)</td>
<td>laboratory and process</td>
</tr>
<tr>
<td>Silicic acid</td>
<td>laboratory and process</td>
</tr>
<tr>
<td>Washing powder</td>
<td>basic powder for process system</td>
</tr>
<tr>
<td>Methacrylate pearls</td>
<td>laboratory</td>
</tr>
</tbody>
</table>
Measuring the Moisture in Wood and Paper

Chips, Fibers, Boards, Pellets, Rolls, Sheets, Webs

The properties of wood products, like all solid and bulk materials, can be measured with increasing accuracy as the homogeneity of the product increases. This makes the microwave resonance method a particularly good choice when it comes to measuring the moisture in well-mixed, pre-dried wood fibers and chips - and the finished products made from them. Measuring specifically benefits from the fact that differences in color, density or board thickness will have no effect.

Quality assurance

During the entire process of plywood, particle and fiber board and wood pellet production, measuring the product moisture plays a decisive role. If the product moisture is too high or too low, it will lead to lower quality, or further processing of the intermediate products may be stopped altogether. Ongoing and accurate moisture measuring allows operators to quickly correct the process if there are any problems and helps to ensure a high level of quality standard.

Dryer control

At various points in the process, moisture must always be within a specified target range. Energy can be wasted if the product is dried more than necessary. For example, if a drier is integrated into the production line, by continuously measuring the moisture content of the product, the drying process can be adjusted automatically to reduce the energy costs.

PRACTICAL EXAMPLES:

<table>
<thead>
<tr>
<th>Product</th>
<th>Moisture Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDF fiber</td>
<td>fiber board production</td>
</tr>
<tr>
<td>Fiber boards</td>
<td>finished boards</td>
</tr>
<tr>
<td>Wood chips</td>
<td>particle board production</td>
</tr>
<tr>
<td>Wood chips</td>
<td>pellet production</td>
</tr>
<tr>
<td>Wooden sticks and boards</td>
<td>parquet production</td>
</tr>
<tr>
<td>Wood chips w/o bark</td>
<td>paper production</td>
</tr>
<tr>
<td>Paper</td>
<td>web in paper machine</td>
</tr>
<tr>
<td>Tissue paper</td>
<td>measuring in rolls</td>
</tr>
<tr>
<td>Paper foils and strips</td>
<td>measuring of samples, fork sensor</td>
</tr>
</tbody>
</table>

An important quality characteristic of the paper processing industry is the moisture profile of rolls of paper. Due to their high-speed measuring technology, microwave resonance instruments for on-line measurements can work within a production line on the fast-moving webs of paper. Moisture will be measured not only at the surface but also inside the paper without being influenced by varying grammage or color hues.

Moisture sensor capabilities include the measuring of glue layers applied to paper and the drying of printing inks.
Typical Measuring Points

Moisture Measuring in Process Systems

<table>
<thead>
<tr>
<th>Quality control at goods receiving point</th>
<th>Measuring for apportionment control</th>
<th>In-process quality assurance</th>
<th>Assurance of product properties</th>
<th>Continuous measuring for dryer control</th>
<th>Quality control of finished product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handheld instruments for mobile measuring</td>
<td>Sensor installed in silo hopper or outlet area</td>
<td>Lab sensors for measuring of samples</td>
<td>Sensor installed at conveyor system transverse</td>
<td>Sensor installed in bypass of main product flow</td>
<td>Sensor installed in wall of buffer silo or down spout</td>
</tr>
</tbody>
</table>

Assurance of product properties

Continuous measuring for dryer control

Quality control of finished product
Moisture and Density Sensors

As versatile as you need them

In practice, moisture sensors need to cope with very different practical requirements depending on the products to be measured, the range of moistures and temperatures, the amount of samples available, the conditions of measuring points etc.

TEWS Elektronik has developed a broad range of microwave sensors of different designs, sizes and sensitivities. Therefore, the instrument that best suits any potential application can be selected.

Except for a few models, every sensor can be operated in every measuring instrument, which can also be used for changing applications. The sensors of the new „Blueline®“ model range feature a built-in ID chip which the measuring system reads out for automatic configuration.

Tubular sensors are filled with the product to be measured. They are suitable for single moisture measurements of powders, granules, pellets etc. Samples of free flowing, non-adhesive products are simply poured through a hopper and, after analysis, released into a dish or similar container under the sensor. Samples of sticky or staining substances or materials that are detrimental to human health can be put into a beaker which is then sealed and briefly placed in the sensor for measuring.

Tubular sensors are used mainly for laboratory use or for making random sample measuring during production. They can be installed in a conveyor bypass, where they are automatically filled and emptied to produce a semi-automated online analysis. Tubular sensors are also suitable for measuring density.

Planar sensors can be installed at a suitable location along a conveyor belt or in a container, to measure the moisture of bulk material in process systems. The product to be analyzed moves in direct contact across the sensor. Stainless steel and high-strength ceramics are used so that the sensors are robust and durable.

Fork sensors are made up of two semi-cylinders that generate the microwave field between them. A typical product sample to be measured will usually come in the shape of boards, foils, strips or fibers, which pass through the fork sensor. Samples can also be pulled continuously through the sensor, which makes fork sensors suitable for both laboratory and process system applications.

These sensors can be installed on planar surfaces where they are fixed locally to measure very small sample volumes - of approx. 0.5 cm³. Other special-purpose sensor models can measure the moisture in up to 12 small-size objects at the same time.
Laboratory Instruments MW 4300 / MW 4310

Accurate, fast and easy to operate

TEWS Elektronik laboratory measuring instruments should be deployed whenever the moisture content of product samples needs to be measured accurately. They are useful where conventional moisture measuring methods, such as drying cabinets and Karl Fischer titrations are too time-consuming.

Analyses are independent of natural variations in product properties, such as color, grain size, salt content or bulk density. These robust and functional systems are extremely easy to operate - making operator error extremely unlikely. Measurements can be stored on a PC network or USB memory stick for further analysis.

A large number of different moisture sensors will be used in the operations of our laboratory measuring instruments. The tubular sensors are also able to measure density.

No preparation of samples required

The TEWS Elektronik measuring method allows the moisture in product samples to be measured without any preparation. No grinding, weighing before and after the test, or use of chemical reagents. The sample under analysis is neither modified nor heated and can usually be returned to ongoing use.

Results obtained within seconds

Measurement results are obtained within seconds. As soon as the sample is filled into the sensor, the result will be displayed and can be stored. The speed of the results can often help to avoid costly process delays.

Analysis of results

Results are stored in the instrument together with the date, time and other operational details. The measuring system or an external PC, can be used to prepare a statistical analysis of results or display a time vs. value chart of sensor readings.

MW 4300 and MW 4310

Laboratory tester MW 4300 features a 10.4" (26.4 cm) color touchscreen monitor for displaying sensor values and for the configuration parameter setup. For display and configuration, MW 4310 requires a commercially available monitor and PC-keyboard. TEWS Moisture View © is installed in both instruments.

STANDARD INTERFACES OF MW 4300 / 4310 LABORATORY MEASURING INSTRUMENTS:

- Serial RS 232 (modem, service)
- Ethernet
- 3 USB
- Analog input (0/4-20mA) for optional IR sensor
- Pt100 temperature sensor port
- Mouse, PC-keyboard, VGA monitor ports
- Automatic sensor detection
Laboratory Instrument MW 1150

Ideal for Routine Measuring

The MW 1150 is designed as a small compact laboratory instrument or atline instrument. It is based on the MW 11xx technology which allows readings within milliseconds to obtain sensor values quickly and reliably. The backlit 5.7” (14.5 cm) monitor displays the results - up to 250 readings can be stored in the system memory, atline applications use the standard 4-20mA standard interface to transfer values to a PLC. There are ports for a P1150-type printer and various temperature sensors.

MW 1150 is set up and calibrated via a PC connection. The cables required and the software TEWS Moisture View Lite © are included in the package.

Almost all MW 4XXX-series laboratory sensors adapt to the MW 1150 circuitry.

MW 1150 introduces you to fast microwave moisture measuring at a reasonable cost.

Configuration

- The moisture analyzer comes as a compact instrument designed for IP20 protection and equipped with a backlit LCD graphics display and an integral sensor of any of the very many different types. Power is supplied through an external pluggable power supply.

Measuring range

- The actual measuring range is specific to the material under analysis and sensors, ranges from 0.1%-70.0% and can be selected in some sections. Supported product temperatures, ranging from 5°C to 60°C, are read using an optional external Pt100 or infrared temperature sensor and are compensated by optional using an automatic temperature-stabilized calibration.

Measuring time

- Less than one second

Product memory

- The EEPROM stores calibrations for up to 25 different products and a total of 250 measuring results.

Ports

- The instrument features an analog output (4-20mA), a USB port for PC connection, a port for external temperature sensor connection (Pt100 or IR), and a printer port for the optional TEWS thermodtransfer printer P1150.

Software

- Besides the on-board firmware, PC communication can be operated using the convenient software TEWS Moisture View Lite ©.
Portable moisture meters MW 1100 and MW 1100S are light-weight and handy models which allow operators to quickly and accurately monitor the moisture in a wide variety of products. They are intended in applications for manufacturers, goods receiving stations and quality control departments.

**Handling**
The sensor of the MW 1100 is flat and dish-like at the bottom, designed to ensure full contact with the sample under analysis. The moisture content is obtained within one second and then displayed. A MW 1100S measurement is made when the lancet probe with the sensor at its tip is pushed into a bale, filled box or similar package.

**Standard configuration**
The compact instrument is battery-operated and features a backlit LCD graphics display and integral planar sensor.

MW 1100-series instruments come in a compact portable case containing the measuring system, a universal loading net part, a charger lead for operation in vehicles, and USB interface cable.

**Measuring range**
The actual measuring range is specific to the material under analysis, ranges from 1 – 50%, and can be selected in some sections. Supported product temperatures range from 5°C to 60°C, are read using the integral infrared temperature sensor and are compensated by optional thermally stabilized calibration.

**Measuring time**
Less than one second

**Product memory**
The EEPROM stores calibrations for up to 25 different products and a total of 250 measuring results.

**Ports**
The instrument features an USB port for PC connection and a charging socket.

**Software**
Besides the on-board firmware, PC communication can be operated using the convenient software TEWS Moisture View Lite ©.
Process Instruments MW 4200 / MW 4260 / MW 4270

Accurate Online Measuring of Material Moisture

Moisture plays an important role in determining product quality or as a process parameter during the processing of food and feedstuffs, chemical, pharmaceutical and mineral substances etc.

Whereas conventional lab-based moisture measuring methods such as drying balances, drying kilns or Karl Fischer titration will return accurate results if handled correctly, they will, however, take at least a couple of minutes or, with some products, several hours before they produce results. These measuring methods are not suitable when a continuous stream of accurate results is required for process or quality control. The microwave resonance method developed by TEWS Elektronik delivers results within a fraction of a second, with the total measuring speed peaking at more than 100 readings per second. This is enough to analyze even quickly flowing products.

There are various methods of online moisture measuring to choose from. By selecting a suitable measuring system for a certain application, care must, however, taken that the readings will not be corrupted by varying product properties (e.g. density, color, graining, surface drying) or by ambient conditions at the measuring point (dust, different piling heights). On account of the measuring technique applied, TEWS moisture Elektronik measuring systems are designed to be insensitive to such interference.

Like the instruments for laboratory use, the process measuring instruments are also made with tough industry environments in mind. For example, MW 42XX-series instruments optionally come in a compact housing equipped with a 24V power supply. Variants with special explosion protection are available for use in areas at risk of explosions. All systems feature a complete set of standard interfaces for sensor value output, the transfer of control signals or for communication with control units. MW 42XX-series process measuring systems can operate all sensors from our „Blueline®“ model range.

The online measuring instrument MW 4270 has a 10.4” (26,4 cm) color touch screen monitor which displays results at the measuring point itself and allows the operator to change any configuration settings immediately at the instrument. MW 4260 has a LC-display for showing the sensor readings. If settings need to be modified on-site, this can be done using the built-in controls. The capabilities of the instrument can be enhanced by connecting the MW 4260 to a PC and running the software TEWS Moisture View ©, which is included in the package.

**STANDARD INTERFACES OF MW 42XX PROCESS MEASURING INSTRUMENTS:**

- Serial RS 422 (PC, PLC etc.)
- Serial RS 232 (modem, service)
- Ethernet
- 1 analog input (0/4-20mA)
- 3 analog outputs (0/4-20mA)
- 8 no potential digital inputs
- 8 no potential digital outputs
- Automatic sensor detection
Software TEWS Moisture View TMV ©
Display, Analyze, Report

TEWS Moisture View © software has a single user interface to connect to all the measuring instruments in the new „Blueline®“ model range. Its many operational, configuration and device management functions are built on 19 years of TEWS Elektronik experience.

Laboratory data
The laboratory version of TEWS Moisture View © has extended spreadsheet functions for the display of measurement results. It supports USB memory sticks and local networks for data exchange. All standard printers are also supported to enable printing straight from the screen.

Process data display
TEWS Moisture View © features an extended set of display options for measuring the moisture in process systems. The measuring system or a PC attached to it can be used to graphically display moisture, density and temperature against time. The software can also be run as an easy-to-use means of configuring the analog and digital interfaces.

TEWS MOISTURE VIEW ©:
– Simple and comprehensible icons for easy operation
– Statistics and diagram functions for data analysis and display
– User administration includes log-in function and log files
– Memory stores personal setup and user profiles
– Context-sensitive help
– Multiple language selection

PC and laptop
If your measuring instrument has no monitor for operation and sensor value display, simply install TEWS Moisture View © software on a personal or laptop computer running the LINUX or Microsoft Windows® operating systems. The computer will communicate with the measuring instrument via Ethernet either in a network or via a PC link cable.

TEWS Moisture View Lite ©
Use TMVL © for data analysis, data storage and configuration of MW 11XX-series portable moisture meters and laboratory measuring instruments. The software controls a reduced set of functions and is included in the package of these systems.
High-speed Instrument MW 3011

For Machine Integration by our OEM Customers

High-speed microwave measuring system MW 3011 is the latest innovation by TEWS Elektronik for parallel moisture and density measurement in rapidly moving products - for instance, cigarette rods during manufacture. 10,000 readings produced via an analog interface can be taken every second.

MW 3011 is used in the tobacco industry for online measurements of moisture and density in the production of cigarettes and cigar rods. Due to its high spatial resolution as well as many other factors, the system can perform an exact control of the cutting position or detection of foreign particles in the product.

The measuring of the filter raw material triacetin can also be controlled during fiber production for the tobacco industry.

Online measurements in quickly moving threads, yarns, weight measurements of tablets or gelatine capsules at a measuring speed of 50 capsules per second using this instrument have also already been performed successfully.

This allows 100% quality control of the measured material.

TECHNICAL DATA:

- **Measuring speed**: 10,000 readings per second
  For example, assuming a production speed of 12,000 cigarettes per minute, equaling 200 cigarettes per second, every single cigarette will be measured at 50 different positions.

- **Accuracy (moisture)**: ± 0,1 bis ± 0,3%
  for tobacco in a moisture range of 5 – 20%

- **Accuracy (mass)**: for example ± 0,5% of final tobacco result within the set density range (0 – 400) mg/cm³

- **Microwave output**: low 15 mW

- **Data outputs**: analog outputs (0-10 V), (0/4-20 mA) for moisture and density, RS 232, RS 422, CAN interface, optional SRM 8000.
Transmission Measuring Instrument MW-T
Non-contact Measuring through Bales and Boxes

Core moisture is of particular interest in the case of large boxes and bales. The microwave transmission instrument MW-T allows non-contact measuring of core moisture irrespective of product density.

Transmission technique
MW-T has connectors for two antennas which mount on either side of the product to be measured. The sending antenna will emit microwaves to go through the product and be picked up by the receiving antenna. The electronic control instrument of MW-T analyzes the signal received and uses it to calculate the moisture and density of the product under analysis. The transmission technique was patented by TEWS Elektronik.

High measuring throughput
Working at high speed, the system takes approx. 30 readings per second which allows for the measuring of moisture and density profiles. Such profiles are useful in two ways: they allow operators to determine a mean moisture and density, and they allow the automatic detection of both foreign particles and places where moisture accumulates.

Fully automatic measuring of parceled goods
Light barriers and the ability to input digital signals allow parceled goods to be measured fully automatically. Moisture and density readings are stored or printed out to labels.

Insensitive to interference
Using MW-T to measure moisture content is not only independent of product densities but also of how the object of analysis is placed within the measuring line. Results are influenced neither by the exact distance between sensors and the product nor by any tilting of the boxes. This is what makes the instrument particularly suitable to industrial applications.

Measuring reflections from the product stream
Since sensors can be oriented vertically, MW-T can be used to carry out non-contact moisture and density measuring by picking up reflections from the product stream. This will always be the preferred option if sensors can easily get dirty through contact with the product or if the product temperature varies greatly.

Practical equipment
MW-T is also built to a robust and industrial design. A dust-proof and airtight stainless steel enclosure keeps its electronics insulated, turning the instrument into a low-maintenance piece of machinery for every industrial environment.

Touch screen and/or PC operation
MW-T has a color touchscreen monitor option to show results at the measuring point and allows all configuration settings to be changed at the instrument itself. The device can be remote-controlled via a network port as well.

STANDARD INTERFACES OF THE MW-T PROCESS MEASURING INSTRUMENT:

- Ethernet
- Analog inputs and outputs
- USB
- Digital inputs and outputs
Profile Measuring Instrument MW 4420 / MW 4430

Moisture and Density Profiles of Cigarettes and Cigars

The MW 4420 measuring station with a hopper for moisture and density profiles of cigarettes, is ideal for controlling the quality of very many different cigarettes, whether with or without filters, filter-tipped, multifilter, etc.

The patented measuring technique allows accurate measuring of cigarette moisture and density regardless of the surface structure or color of the cigarette under analysis. The horizontal cigarette transport bar ensures perfect results, allowing the moisture and density profile of every cigarette brand to be calculated independently of each cigarette diameter. The MW 4430 measures cigars the same way.

Easy operation

The integrated color touch screen and its self-explanatory user interface allow the system to accurately keep track of results in conformity with ISO 9000. The following details are read and kept: time, date, cigar and cigarette brand and make as well as minimum, maximum and average moisture and density values.

Results as mean values, standard deviation, minimum and maximum are shown graphically as an output to the screen and printer. Data can be exported to an USB memory stick for further processing by external programs such as spreadsheets. The Ethernet port allows integration into enterprise network, as appropriate.

TECHNICAL DATA MW 4420 / MW 4430:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>5 – 18%</td>
</tr>
<tr>
<td>Repeatability</td>
<td>0.05% (standard deviation based on 10 readings from the same sample)</td>
</tr>
<tr>
<td>Measuring speed</td>
<td>8 cigarettes per minute / 2 cigars per minute</td>
</tr>
<tr>
<td>Cigarette size</td>
<td>max. length: 144 mm, max. diameter: 9 mm</td>
</tr>
<tr>
<td>Cigar size</td>
<td>max. length: 280 mm, max. diameter: 22 mm</td>
</tr>
<tr>
<td>Data repository</td>
<td>SQL database</td>
</tr>
<tr>
<td>Features</td>
<td>hopper with a capacity for 100 cigarettes (only MW 4420), 10.4” (26,4 cm) TFT touch</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>0 – 40 °C</td>
</tr>
<tr>
<td>Interfaces</td>
<td>Ethernet, USB</td>
</tr>
<tr>
<td>Mains connection</td>
<td>(110 - 230) V / (50 - 60) Hz / 90 VA</td>
</tr>
</tbody>
</table>
Accessories

Extensive, user-friendly Range

- Belt bag

MW 1100:
- Thermoprinter P 1150
- Pt100 temperature sensor
- External infrared temperature sensor
- Connector kit for analog output 4-20 mA
- Hoppers, brushes, dishes
- Spare beakers for beaker sensors

MW 1150:
- Printer
- Hoppers, brushes, dishes
- Spare beakers for beaker sensors
- External analog remote display
- PC software TEWS Moisture View ©

MW 4300 / MW 4310:
- Printer
- Hoppers, brushes, dishes
- Spare beakers for beaker sensors
- External analog remote display
- PC software TEWS Moisture View ©

MW 4200 / MW 4260 / MW 4270:
- Printer
- Modem for remote maintenance
- Infrared temperature sensor
- Analog remote display
- Display and control panel
- PC software TEWS Moisture View ©
## Technical Data

### Instruments, Sensors, Combinations, Dimensions.

#### SENSORS:

<table>
<thead>
<tr>
<th>Model</th>
<th>Typical product</th>
<th>Sensitivity</th>
<th>Volume (ml)</th>
<th>Ø* (mm)</th>
<th>Beaker possible</th>
<th>Size* WxHxD (mm)</th>
<th>Weight* (kg)</th>
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</thead>
<tbody>
<tr>
<td>SLE-10</td>
<td>powder, cigarettes</td>
<td>high</td>
<td>9</td>
<td>10</td>
<td>no</td>
<td>255x265x280</td>
<td>5</td>
</tr>
<tr>
<td>SLE-10B</td>
<td>powder, granules</td>
<td>medium</td>
<td>5</td>
<td>10</td>
<td>yes</td>
<td>255x265x280</td>
<td>5</td>
</tr>
<tr>
<td>SLE-16</td>
<td>powder, granules</td>
<td>very high</td>
<td>22</td>
<td>16</td>
<td>no</td>
<td>255x265x280</td>
<td>5</td>
</tr>
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<td>SLE-20B</td>
<td>powder, granules</td>
<td>medium/high</td>
<td>14–22</td>
<td>20</td>
<td>yes</td>
<td>255x150x280</td>
<td>5</td>
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<td>SLE-26</td>
<td>powder, granules</td>
<td>very high</td>
<td>80</td>
<td>26</td>
<td>no</td>
<td>255x305x280</td>
<td>6</td>
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<tr>
<td>SLE-26exz</td>
<td>cigars</td>
<td>medium/high</td>
<td>–</td>
<td>26</td>
<td>no</td>
<td>150x280x315</td>
<td>6</td>
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<td>SLH-40B</td>
<td>paste-like, bulk material</td>
<td>low/medium</td>
<td>60–160</td>
<td>40/50</td>
<td>yes</td>
<td>365x205x275</td>
<td>9</td>
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<tr>
<td>SLH-46</td>
<td>powder, bulk material</td>
<td>medium/high</td>
<td>350</td>
<td>46</td>
<td>no</td>
<td>365x390x280</td>
<td>11</td>
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<td>SLH-75B</td>
<td>bulk material</td>
<td>medium</td>
<td>375</td>
<td>75</td>
<td>yes</td>
<td>365x170x410</td>
<td>14</td>
</tr>
<tr>
<td>SLH-96</td>
<td>bulk material</td>
<td>medium/very high</td>
<td>1600</td>
<td>96</td>
<td>no</td>
<td>365x390x410</td>
<td>15</td>
</tr>
<tr>
<td>SLF-60-16</td>
<td>foils, paper</td>
<td>very high</td>
<td>–</td>
<td>–</td>
<td>no</td>
<td>255x155x390</td>
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**Online-Sensors**

<table>
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<tr>
<th>Model</th>
<th>Type</th>
<th>Sensitivity</th>
<th>Volume (ml)</th>
<th>Ø* (mm)</th>
<th>Beaker possible</th>
<th>Size* WxHxD (mm)</th>
<th>Weight* (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPP-160-008</td>
<td>very moist products</td>
<td>low</td>
<td>–</td>
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<td>no</td>
<td>188x90</td>
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<td>SPP-80-008</td>
<td>very moist products</td>
<td>low</td>
<td>–</td>
<td>–</td>
<td>no</td>
<td>140x130</td>
<td>3</td>
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<td>SPP-160-015</td>
<td>boards, granules</td>
<td>low</td>
<td>–</td>
<td>–</td>
<td>no</td>
<td>188x85</td>
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<td>SPP-160-030</td>
<td>boards, granules</td>
<td>medium</td>
<td>–</td>
<td>–</td>
<td>no</td>
<td>188x85</td>
<td>3</td>
</tr>
<tr>
<td>SPP-160-080</td>
<td>boards, granules</td>
<td>high</td>
<td>–</td>
<td>–</td>
<td>no</td>
<td>188x85</td>
<td>3</td>
</tr>
<tr>
<td>SPE-20 / SPE-26</td>
<td>powder, granules</td>
<td>high/very high</td>
<td>50/80</td>
<td>20/26</td>
<td>no</td>
<td>245x130x122</td>
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<td>SPH-46</td>
<td>bulk material</td>
<td>medium</td>
<td>approx. 500</td>
<td>50</td>
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<td>390x170x255</td>
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<td>SPH-96</td>
<td>bulk material</td>
<td>medium/very high</td>
<td>approx.</td>
<td>2000</td>
<td>100</td>
<td>375x380x290</td>
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#### MEASURING INSTRUMENTS:

<table>
<thead>
<tr>
<th>Model</th>
<th>Size* WxHxD (mm)</th>
<th>Weight* (kg)</th>
<th>Housing</th>
<th>Display</th>
<th>Laboratory use</th>
<th>atline use</th>
<th>online use</th>
<th>Moisture-monitor</th>
<th>Display-monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW 4300</td>
<td>350x220x435</td>
<td>12</td>
<td>plastic/aluminium</td>
<td>10.4”</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>MW 4310</td>
<td>350x220x435</td>
<td>12</td>
<td>plastic/aluminium</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
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<tr>
<td>MW 1150**</td>
<td>240x70x170</td>
<td>1.5</td>
<td>plastic</td>
<td>5.7”</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>MW 1100</td>
<td>210x100x310</td>
<td>1.5</td>
<td>plastic</td>
<td>3.5”</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
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<tr>
<td>MW 1100S</td>
<td>240x130x960</td>
<td>3.5</td>
<td>aluminium</td>
<td>3.5”</td>
<td>yes</td>
<td>no</td>
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<tr>
<td>MW 4200</td>
<td>320x130x190</td>
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<td>no</td>
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<td>Ja</td>
<td>–</td>
<td>–</td>
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<tr>
<td>MW 4260</td>
<td>415x530x240</td>
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<td>MW 4270</td>
<td>415x530x240</td>
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<td>MW 3011</td>
<td>430x270x160</td>
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<td>MW-T</td>
<td>600x540x350</td>
<td>approx. 50</td>
<td>stainless steel</td>
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<td>MW 44X0</td>
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* 1 kg = 2.2 pound, 1 mm = 0.039 inch

** plus sensor
<table>
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<tr>
<th>Housing</th>
<th>Model</th>
<th>Combines with</th>
<th>MW 1100</th>
<th>MW 1100S</th>
<th>MW 1150</th>
<th>MW 4260</th>
<th>MW 4270</th>
<th>MW 4300</th>
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