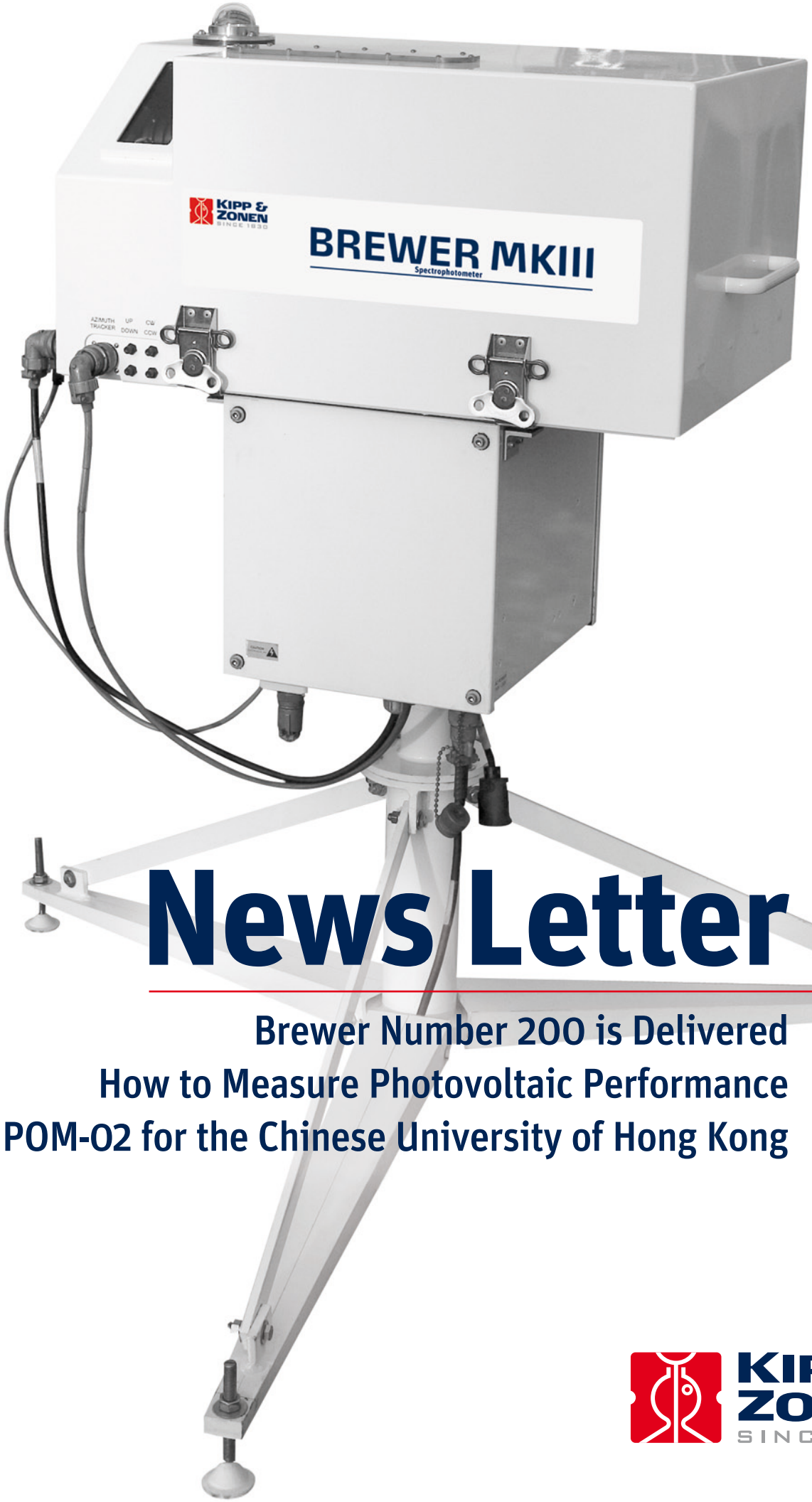


News Letter 10

Brewer Number 200 is Delivered
How to Measure Photovoltaic Performance
POM-02 for the Chinese University of Hong Kong

KIPP & ZONEN
SINCE 1830

Content

October 2009

Contact

If you have a news item for the news letter or want to share your experiences with Kipp & Zonen applications and contribute to our next issues, please e-mail the editor: kelly.dalu@kippzonen.com

Autumn has arrived

Now that we are into the fall season, we can look back on an eventful summer. Hopefully you all enjoyed relaxing holidays and are now well rested and ready for new ideas. Kipp & Zonen is doing well, despite the global economic crisis, and our order book is healthy. However, we are not standing still! To continue our success means more investment in products and services. Michael van Alebeek is now fully involved in all product support issues and our website, which regularly has new features to make information retrieval easier and more effective.

We are very active in the Solar Energy market and this Newsletter features an interesting article by Ing. Guiseppe Terzaghi of the Albarubens test laboratory in Italy. Also aimed at Solar Energy is the new 'sleep mode' for the SOLYS 2 sun tracker

In the 1970s Alan Brewer, and the team of Tom McElroy, Jim Kerr and David Wardle from Environment Canada, designed a new, automatic, all-weather, instrument for measuring the amount of Ozone in a column of atmosphere. This resulted in the 1981 introduction of the Brewer Mk II Ozone Spectrophotometer (Mk I versions were prototypes) to replace the manually operated instrument developed by Gordon Dobson in the 1930s. The current Brewer Mk III model entered production in 1992.

A landmark is the delivery of Brewer Spectrophotometer number 200 to the Japanese Meteorological Agency (JMA), for installation on Marcus Island in the Pacific Ocean. Kipp & Zonen is proud to be the exclusive manufacturer of this unique instrument and to celebrate the delivery of the 200th Brewer. At the end of September the Aosta Valley Regional Environmental Protection Agency (ARPA) in Italy is hosting the biannual Brewer User Group Meeting and, of course, Kipp & Zonen will be there.

You can meet us at the annual European Meteorological Society meeting, which this year is being held in Toulouse. During the conference Kipp & Zonen will present its annual award for Boundary Layer Meteorology Research to Marko Princevac for his paper "Field, Laboratory and Numerical Study of Turbulent Dispersion in Built Environments".

Have a pleasant and fruitful autumn!

Yours sincerely,

Ben Dieterink, President
Kipp & Zonen B.V.

Brewer Number 200 is Delivered

It is a record year for Brewer sales! Usually we deliver 5 or 6 Mk III Brewers per year, but so far in 2009 we have orders for 10 units. Amongst these is Brewer number 200, which has been supplied to the Japan Meteorological Agency (JMA).

Minami Torishima (Marcus Island)

JMA already has an extensive network of Brewers, at locations including Tsukuba, Sapporo, Naha, and the Showa Antarctic Base. The agency has a programme to replace existing Mk II and Mk IV Brewers with Mk III instruments because of their enhanced UV measurement capability, in particular the ability to very accurately monitor the Erythemal Ultraviolet Radiation (UVE) that causes public health problems. The Mk III Brewers can also act as the reference instruments for local networks of broad-band UV radiometers.

Brewer number 200 will be installed at Minami Torishima (Marcus Island) in the north-western Pacific Ocean. The existing Mk II Brewer will probably remain, as a back-up. This is an isolated coral island surrounded by a reef and is the most easterly territory belonging to Japan, more than 1800 km from Tokyo. The island has a coastline of about 6 km and the centre is actually below sea level.

The Brewer was supplied through our Japanese distributor Leica Microsystems K.K. and our long-standing partner Prede Co. Ltd., who install and maintain the Brewers in Japan ■

SOLYS 2 Sleep Mode

We have introduced an update to the SOLYS 2 firmware that reduces the power drawn by the tracker at night-time. Because the SOLYS 2 can operate from 24 VDC power it is ideal for use on remote sites using solar energy. However, it is desirable to reduce the power requirement as much as possible because this affects the size of the solar panel and the battery capacity needed.

When the SOLYS 2 is tracking the sun it takes less than 25 W at 24 VDC but, up until now, this remains the same at night time when the tracker does not need to move. The firmware update reduces the power to approximately 13 W at night. When the sun has set the tracker will go into a sleep mode, and it will wake up again in time to find its home position and reset before the sun rises above the horizon. The solar zenith angle settings allow for the tracker being installed on a mountain and for locations in high latitudes where the sun may not fully go below the horizon.

This firmware update has been fitted to all new SOLYS 2 trackers delivered since mid-September and can be down-loaded from our website and installed in existing trackers by the user. Full information on how to do this and about the Sleep Mode operation can be found in the latest version of the SOLYS 2 manual, also available on our website ■

How to Measure Photovoltaic Performance

Albarubens S.r.l. is a test laboratory, located near Milan in Italy, that specialises in Solar Energy systems. The company name means 'red sunrise' in ancient Latin. Albarubens performs testing and certification of PV panels for power plant projects, which are used to help decision making by the project managers. The laboratory is accredited under IEC 17025 for all the performance and endurance tests on photovoltaic (PV) solar panels, as described in the standards IEC EN 61215 (crystalline silicon), IEC EN 61646 (thin film) and IEC EN 61730-2 (safety aspects). By the end of 2009, Albarubens will also be testing to IEC 62108 (concentrators) and EN 12975 (thermal solar panels).

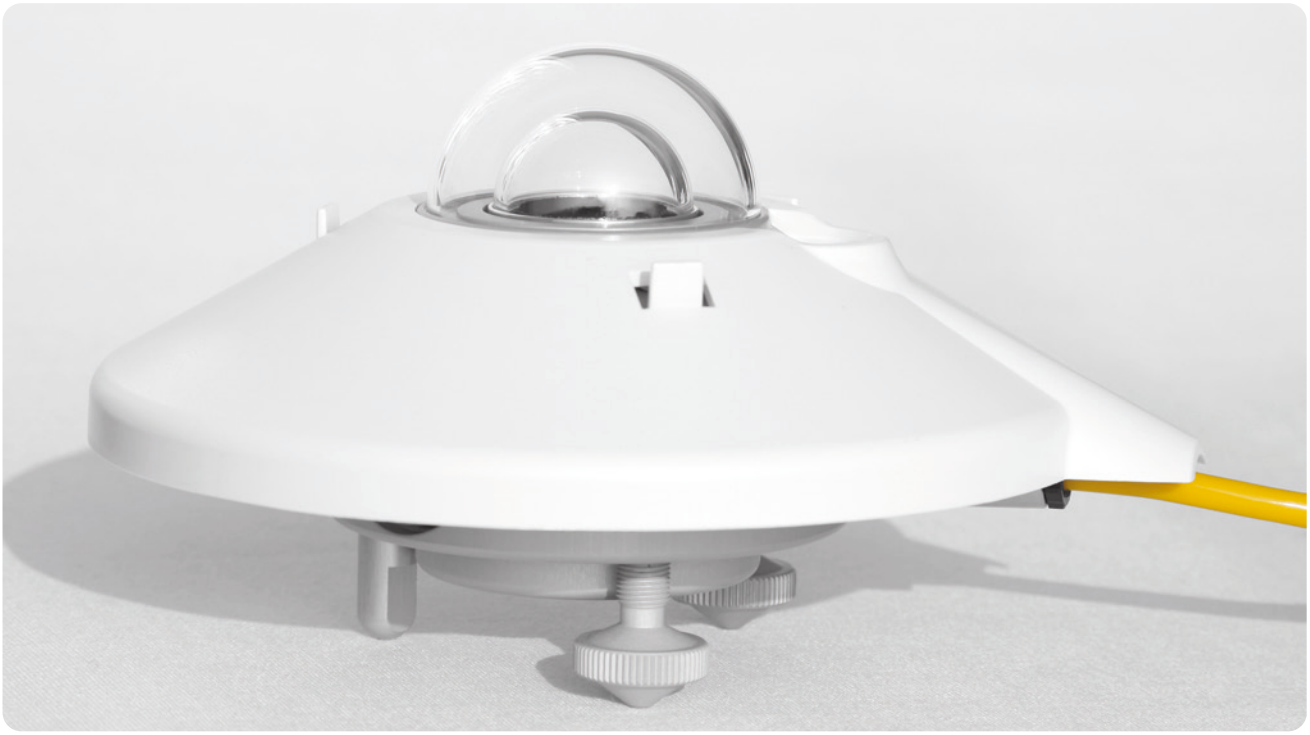
The main performance test carried out by Albarubens is the measurement of the maximum electrical power generated by a PV panel per square metre. This value depends on the module technology, which is the main factor to be considered in the choice of PV systems.

Research and development in this field results in constantly improving performance. The differences between panels from various manufacturers are quite small, so an objective power measurement has to be made with very high precision and low uncertainty to certify the performance. The quality of the measurement depends on the accuracy of the measurement of electrical power output and the solar irradiance available to the panels.

Of course, the electrical power generated by PV depends on a number of factors; the total incoming radiation, its spectrum, the angle of incidence, the module temperature and other parameters. Usually power is measured under Standard Test Conditions of 1000 W/m² solar radiation at an ambient temperature of 25 °C and with Air Mass 1.5. The Air Mass (AM) is the amount of atmosphere that light directly from the sun passes through to reach the ground, and this depends largely on the solar elevation.

The spectrum of the light is affected by the Air Mass. The Standard Test Conditions are equivalent to a clear sunny day at sea level in mid latitudes with the sun at 45 ° zenith angle.

Albarubens performs testing and certification of PV panels for power plant projects



Usually Albarubens performs measurements using a Kipp & Zonen CMP 11 pyranometer

Most manufacturers of PV modules carry out performance tests using a 'solar simulator' based on a Xenon flash lamp and an electronic load with power meter. The main advantage of testing in artificial conditions is the possibility to work at any time and independently of the weather conditions. Also, the solar simulator can be easily integrated into production line testing.

On the other hand, this also shows problems. The data requires a spectral mismatch correction, the lamp output is not homogeneous on the PV surface, and flash duration is very short (2-10 ms). This very short pulse requires a PV reference cell as the irradiance meter, but these have an uncertain spectral response. All together these problems results in a high uncertainty of the measurement; up to 6 % for commercial grade equipment and 2 % for very expensive laboratory types.

Since the beginning, Albarubens has chosen to measure the PV power under natural sunlight, which restricts the number of measurement days in a month. However, this is a negligible problem because all the other tests required by the standards take more than 2 months. Moreover, in Italy, there are many sunny days in a two month period even in winter. Under natural sunlight there are no problems with spectral simulation, source stability, duration or homogeneity. Importantly, they can use a high precision pyranometer to measure the solar irradiance.

Usually Albarubens performs measurements using a Kipp & Zonen CMP 11 pyranometer as the absolute irradiance meter, plus a reference PV module for comparison. The pyranometer calibration is traceable to the World Radiation Centre (WRC) in Davos, Switzerland and the reference modules to inter-laboratory comparisons. The parallel use of two reference sources minimises the total uncertainty. Every test is repeated ten times to calculate the mean value and repeated again in the rare case that the standard deviation is higher then 0.2 %. Albarubens regularly obtains a global radiation uncertainty of better than 1.8 % (k = 2 - 95 %).

Albarubens is confident that the best way to quantify PV module performance, for certification purposes, is in their real working condition - natural sunlight! ■

We wish to thank
Ing. Giuseppe Terzaghi of Albarubens
for contributing this article.

For more information please visit
www.albarubens.it

POM-02 for the Chinese University of Hong Kong

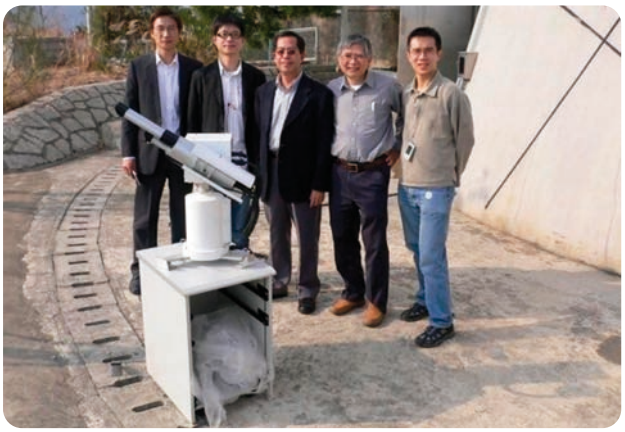
The effects of ground-level anthropogenic aerosols on the environment and human health are relatively well established, but there are large uncertainties in the impacts of atmospheric aerosols on weather and climate systems. The effects of aerosols have not been fully incorporated into models for the most recent Intergovernmental Panel on Climate Change (IPCC) Report, the Fourth Assessment, published in 2007. Much more investigation needs to be carried out for the Fifth Assessment, due in 2014.

A leading research centre is the Chinese University of Hong Kong (CUHK), which also houses the Institute of Space and Earth Information Science (ISEIS). Professor Long Chiu of ISEIS has been involved with the joint NASA/JAXA Tropical Rainfall Measuring Mission (TRMM) and his research interests include microwave remote sensing, global and regional hydrology, air-sea interactions and climate change. His department has recently acquired from Kipp & Zonen a POM-02 sky radiometer that will be installed at the newly constructed Fok Ying Tung Remote Sensing Science Center building.

One of the objectives is to study stratospheric aerosols. Primarily, this refers to water vapour and suspended particles, mainly smoke, dust, sand and ash. These may be generated by human activity; for example industry and the deliberate burning of forests, or by natural events; such as volcanoes and desert sand storms. The aerosols absorb and scatter solar radiation and promote atmospheric chemical reactions. They also act as nuclei for the formation of clouds, rain and other precipitation.

The POM-02 will complement other meteorological and environmental instruments to investigate the interactions between aerosols, clouds and precipitation and to calibrate satellite algorithms for aerosol measurements. The target is to improve the understanding of the role of aerosols in regional and global climate change and phenomena such as 'global dimming'.

A&P Instrument Co. Ltd. has been the Kipp & Zonen distributor in Hong Kong for more than 10 years. They suggested the POM to Professor Chiu and the POM-02 model was chosen, because it offers more wavelengths than the POM-01, extending into the near infrared. A&P also carried out the installation and commissioning at ISEIS, where a test run of the POM-02 showed very good results. As soon as the new building construction is finished, the POM-02 will move to its permanent location at the Fok Ying Tung Remote Sensing Science Center ■



The POM-02 being unpacked for testing at the Chinese University of Hong Kong (picture provided by Prof. Long Chiu, CUHK/ISEIS)

Mierij Meteo Industrial Wind System

Mierij Meteo's entry level Wind System with LED panel display is used for a large variety of industrial applications.

This basic wind system accurately measures wind speed and wind direction using the industrial grade MW 21 combined wind sensor. The MD 11 display unit clearly shows the wind direction on a compass rose and wind speed in knots or m/s (minimum, maximum and average). The real-time information helps control room operators to make the right decision for their processes, such as:

- Avoiding working at height in strong winds
- Reducing or stopping industrial processes in certain wind conditions due to environmental restrictions
- Providing information to vessels
- Providing information to emergency personnel in case of accidents or emissions of toxic gasses
- Restricting access to, or the opening of, bridges in strong winds

The MW 21 combined wind sensor is very simple to install and can operate with long cables, up to 1000 meters. The easy-to-read flat display panel has red LED indicators and is simply mounted to a wall in control rooms or other locations where real-time readout of the wind data is needed. The optional MU 32 data logger can store the measured values of wind speed and wind direction on a SD card of up to 2 GB capacity.

Kipp & Zonen Award

At the annual meeting of the European Meteorological Society in Toulouse, France, Kipp & Zonen will present its 2009 award for Boundary Layer Meteorology Research to Marko Princevac, lead researcher for the paper "Field, Laboratory and Numerical Study of Turbulent Dispersion in Built Environments".

Marko is an established researcher at the University of California at Riverside, specialising in urban and complex terrain boundary layer meteorology. Through integrated approaches to field measurements, numerical modelling and carefully designed laboratory experiments, Marko has been able to show detailed flow and dispersion patterns in complex urban areas in Southern California, with general applications to other cities.

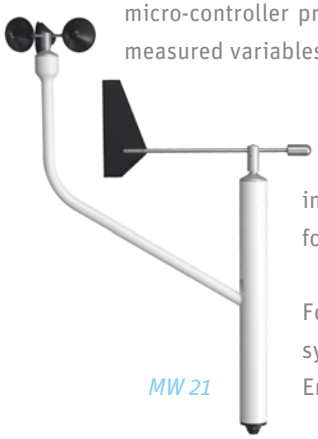
In the laboratory he used transparent building models to obtain flow measurements in a horizontal plane with a range of complexity and scales, from simple boxes to scale models of downtown Los Angeles and Long Beach. Field measurements were conducted in southern Californian cities. Meteorological towers were placed in Wilmington (next to the port of Los Angeles), Palm Springs, Lancaster and Citrus Plantation in Riverside. These covered four different land uses: urban coastal, urban desert, desert and agricultural, respectively.

Mean winds, temperature, relative humidity and surface energy balance components were measured at each location. The four radiation components (incoming and outgoing short-wave and long-wave) were measured using the Kipp & Zonen CNR 1 net radiometer and, in Wilmington, vertical temperature profiles were measured using the MTP 5.

Meteorological tower placed in Lancaster

New models were developed for estimates of sensible, latent, and soil fluxes over different surfaces and surroundings. With the laboratory and field work, this extensive study for the first time explained the phenomenon of lateral channelling in regular arrays of buildings, which is responsible for the sudden plume spreading of gasses and pollutants. The judging committee decided that this innovative work made Marko a worthy winner of the 2009 Kipp & Zonen Award ■

MW 21 has an optical digital measuring principle and a fast response time. The static discharge circuit protects the sensor against inductive interference and the MD 11 panel display is optically isolated from the sensor. An internal micro-controller processes the signals and calculates the measured variables.



MW 21

This wind system has proven its quality and reliability over many years in harbours, the petro-chemical industry, for bridge operations and sluice control.

For more information, a quotation, and system drawings please contact Barry Engelen: be@mierijmeteo.nl ■

Fairs & Events

9th EMS Annual Meeting Toulouse - France	28 Sept. - 2 Oct. 2009
Int. Sctintillometer Workshop New Mexico - USA	12 - 15 October 2009
Solar Power International Anaheim - California - USA	27 - 29 October 2009
AGU Fall Meeting San Francisco - USA	14 - 18 December 2009
AMS 90th Annual Meeting Atlanta - Georgia - USA	17 - 21 January 2010

Passion for Precision

Kipp & Zonen is the leading company in measuring solar radiation and atmospheric properties. Our passion for precision has led to the development of a large range of high quality instruments, from all weather radiometers to complete measurement systems.

We promise our customers guaranteed performance and quality in: Meteorology, Climatology, Hydrology, Industry, Renewable Energy, Agriculture and Public Health.

We hope you will join our passion for precision.

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