outdoor

General Catalog

Systems

Meteorological sensors for Air Quality Monitoring systems and networks

LSI LASTEM

Milano
ITALY

MW9025-ENG 05/2013

> Air Quality Monitoring

Meteorological sensors for atmospheric dynamics analysis in Air Quality Monitoring (AQM) systems and networks

Why reliable meteorological measurements are critical for Air Quality Monitoring

Meteorological conditions are a vital element of Air Quality Monitoring Systems and Networks. As the fate of air pollutants is influenced by the movements and characteristics of the air mass into which they are emitted, no air quality data is complete without an accurate in situ record of meteorological conditions.

Atmospheric dynamics determine the formation, transport, and destruction of pollutant material. Observed meteorological data are at the core of the air quality models used to capture the atmospheric conditions occurring at a source and/or receptor location, and therefore, play an important role as they effect the concentration of pollutants at receptors of interest. If the air is calm and pollutants cannot disperse then the concentration of these pollutants will build up. Conversely, if a strong, turbulent wind is blowing any pollution generated will be rapidly dispersed into the atmosphere resulting in lower pollutant concentrations in the air.

In Air Quality Monitoring applications, meteorological data are typically used as input for:

- **Air quality Indexes calculation**
- **Diffusion models**
- **Thermal inversions**
- **Atmospherics stability categories determination**
- **Mixing height**
- **Venting indexes calculation**
- **High pollutant concentration days forecasting**

Primary meteorological variables for AQM applications include wind speed, wind direction and turbulence intensity. The turbulence intensity of the atmosphere is typically referred to as atmospheric stability. Characterization of atmospheric stability for dispersion modeling purposes involves measurements of temperature, radiation intensity, and wind speed. Other parameters of interest are Relative humidity, precipitation, pressure and radiation (global, net and UV irradiance).

Introduction

Meteorological sensors for Air Quality Monitoring (AQM) systems and networks

www.lsi-lastem.it

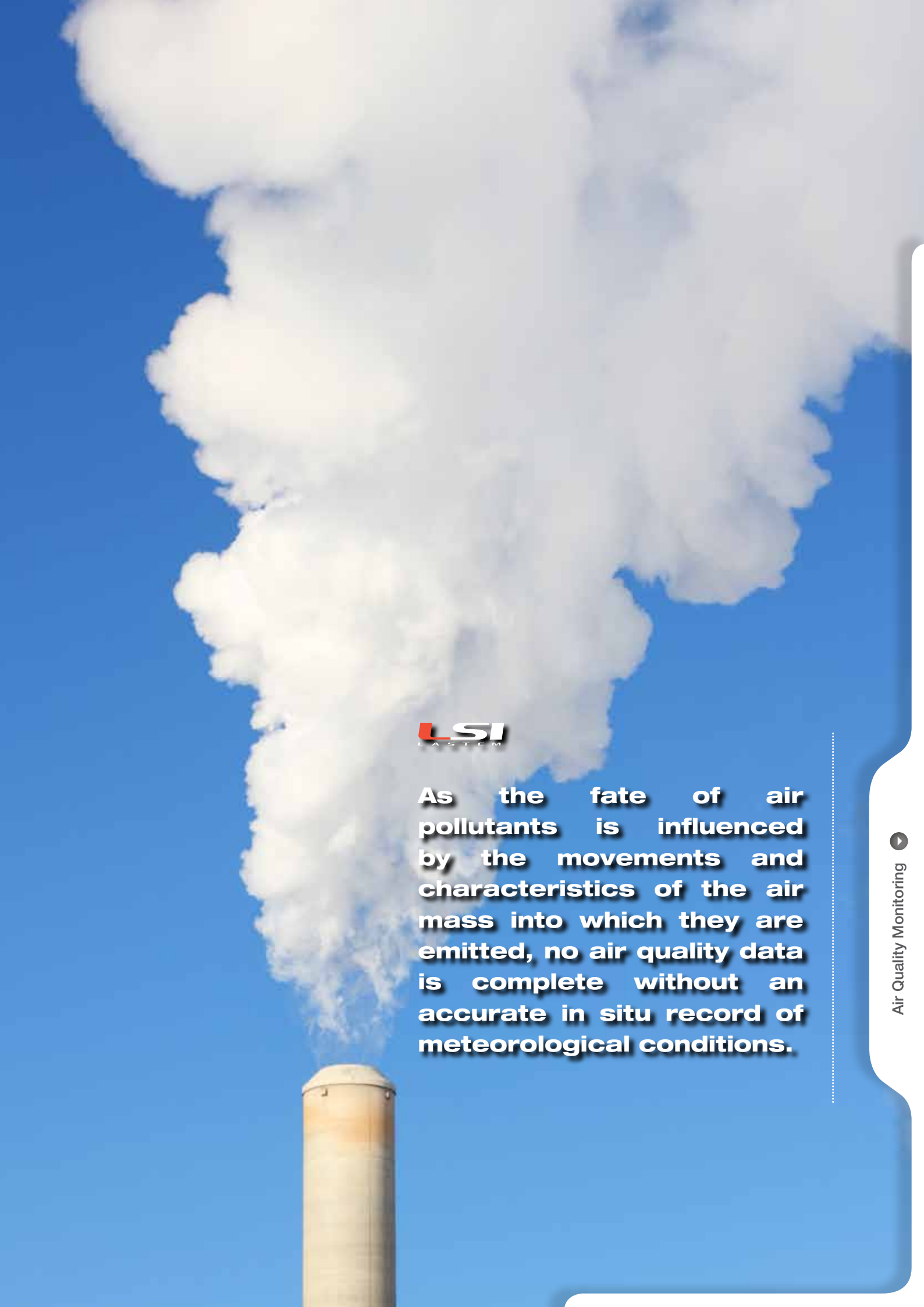
Over the years, LSI LASTEM has become the preferred choice of AQM manufacturers and system integrators world-wide, thanks to the most complete range of meteorological sensors and solutions specifically dedicated to the market.

Our range guarantees:

- Adherence to relevant standards (ISO and WMO)
- Ease of integration with built-in analogue output and, today, ASCII and Modbus RTU digital interface
- Built-to-last design and materials
- Complete range of sensors: heated versions (anemometers, rain gauges), aspirated thermometers, complete range of solar radiometers (global, net and UV)
- Arms, poles and towers for optimal siting and exposure
- Calibration and maintenance services

Applications

- **Air Quality Monitoring Systems (AQMS) and networks**
- **Continuous Emission Monitoring Systems (CEMS)**
- **Data management and air quality modeling**



As the fate of air pollutants is influenced by the movements and characteristics of the air mass into which they are emitted, no air quality data is complete without an accurate in situ record of meteorological conditions.

Meteorological sensors for atmospheric dynamics analysis in Air Quality Monitoring (AQM) systems and networks

Highlights

- Adherence to relevant standards (ISO and WMO)
- Ease of integration with built-in analogue output and, today, ASCII and Modbus RTU digital interface
- Open power supply: 10-30 Vac/dc
- Built-to-last design and materials
- Complete range of sensors: heated versions (anemometers, rain gauges), aspirated thermometers, complete range of solar radiatiometers (global, net and UV)
- Arms, poles and towers for optimal siting and exposure
- Easy installation due to cable length and built-in arms for diam.45-65 mm pole
- Calibration and maintenance services

LSI LASTEM designs and manufactures the most complete range of meteorological sensors and solutions specifically dedicated to AQM applications. Our extensive range includes: wind speed, wind direction, temperature&relative humidity, radiation (global, UV-A, UV-B, net), atmospheric pressure and rain sensors. All the sensors are designed for easy mounting on a pole or tower and have connectors in order to choose a cable of the proper length to the data acquisition system.

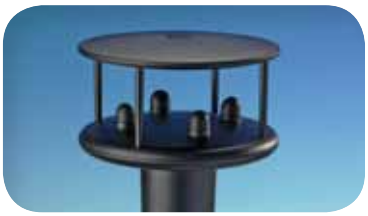
LSI LASTEM has a long-lasting tradition and experience in this field of application. In the 80s our company supplied the first sensors and acquisition system for wind and atmospheric stability categories evaluation to ENEL (Italian National Authority for Electric Energy) to study plume dynamic in power plants. Over the years, LSI LASTEM has developed strong bonds with many pollution control institutions, air quality analyzers manufacturers and system integrators throughout the world. Nowadays, LSI LASTEM supplies his line of sensors to partners, OEM and distributors in every continent.

Main features

Wind speed sensor

Wind speed determines the amount of initial dilution experienced by a plume and, in conjunction with other variables, atmospheric stability. According to the US Environmental Protection Agency (EPA), sensors with high accuracy at low wind speeds and a low starting threshold should be used.

LSI LASTEM anemometers complies with such accuracy and threshold requirements. Our catalogue features both cup (DNA801) with very low threshold (0,36 m/s) and sonic anemometers (DNB005).



Heater system is available on the Cup anemometers (DNA802).
Cup anemometers maintain a better overall accuracy than ultrasonic, specially during heavy rains. Ultrasonic anemometers have the advantage of having no moving parts and requiring little maintainance – furthermore they are especially suited for use in direct measurements of turbulence.

Wind direction sensor

Wind direction determines the transport direction of an emitted plume. Furthermore, the standard deviation of the wind vector can be related to the dispersive capabilities of the atmosphere. According to the US Environmental Protection Agency (EPA), the starting threshold should be less than 0.5 m/s and resolution should be of 1° in order to calculate the standard deviation.
LSI LASTEM wind vanes (DNA810) easily complies with both specifications. Heater system is available for cold weathers (DNA811). For a compact solution, LSI Lastem catalogue offers also a Combined cup&vane anemometer (DNA821), also perfectly compliant with EPA requirements.

continued

Temperature&Relative Humidity, Dew point and temperature difference

Both ambient air temperature at a single level (typically 2 m above ground) and temperature difference between two levels (typically 2 m and 10 m) are extremely useful in air pollution studies. Ambient temperature is used in determining the amount of rise experienced by a buoyant plume. The vertical temperature difference is used in calculating plume rise under stable atmospheric conditions and in determining stability parameters. Relative humidity is an important variable in determining impacts from moist sources, such as cooling towers; it is also used in modeling ozone chemistry. According to the US Environmental Protection Agency (EPA), a well ventilated shelter may be adequate for surface temperature measurements but would be impractical for levels higher than a few meters above ground. Tower-mounted sensors are generally housed in aspirated radiation shields. LSI LASTEM offers both solutions: Termohygrometers with high efficiency radiation shield with natural (DMA875) or forced ventilation (DMA867) aspirated shield options.
Temperature sensor has 0,1°C accuracy (1/3 DIN Pt100 element). RH% is measured by a capacitive sensitive element mounted inside the temperature sensor. Capacitive element with 1,5% accuracy and porous filter has been mainly designed for meteorological applications, protecting the capacitive film from damage caused by pollutants and humidity levels prolongedly near saturation point. When Dew Point Temperature is most important, LSI Lastem Thermohygrometers RH output can be easily switched to Dew Point. To calculate the temperature difference or to perform more complex calculations, LSI LASTEM can supply a data acquisition system with environmental and arithmetical functions.

Solar radiations

Solar and/or net radiation data are used to determine atmospheric stability, to calculate various surface-layer parameters used in dispersion modeling, to estimate convective mixing heights, and to model photochemical reactions.
Significant levels of UV-A and UV-B radiation in conjunction with high temperatures can have effect over the chemical reactions of the pollutants.
LSI LASTEM has one of the most complete catalogues of solar sensors available on the market, including ISO9060 Pyranometers (DPA854-860), Net (DPA840), UV-A (DPA816) and UV-B (DPA821) radiometers.

Rain

All forms of precipitation wash pollutants from the air and onto the ground reducing the pollutant concentration. Rain quantity and rainfall period are used for consistency checks in data review and validation in all air quality analysis.
LSI LASTEM supplies tipping bucket type rain gauges with (DQA131.1#C) or without (DQA130.1#C) heater.
The heater is thermostatically controlled, rather than continuously operating, to avoid underestimation due to evaporation.
Rain gauges can be connected to Integrators(DEA280-285) in order to obtain 4-20 mA output.

Atmospheric pressure

Air pressure affects build up of pollution levels. In case of high pressure fronts, the air is usually still which allows pollution levels to build up more.
LSI Lastem pressure sensors (DQA201-201) should be mounted inside shelters or IP65 boxes, preferably nearby the gas analyzers.

Calculator

To perform more complex calculations, LSI LASTEM can supply a data acquisition system with environmental and arithmetical functions (ELO105).
Calculator features include:

1. Delta T from two temperature sensors
2. Dew Point temperature
3. Wind elaborations, optimized for stability categories determination: Prevalent sector, Resultant wind speed, Standard Deviation of the wind direction.Percentage of calm.
4. Modbus RTU or TTY data output
5. Back-up memory system

Calculator can be connected to sensors with 4-20 mA output or to LSI LASTEM sensor range with direct signal output.In the latter case,preconfigured KME103 kit includes the following parts:

ELO105	N.12 input unit, power supply 12 Vcc n.2 RS232 ports
DNA202	Wind speed sensor
DNA212	Wind direction
DMA672.1	Temp+RH% sensor
DQA240.1	Pressure sensor
DPA053	Solar radiation sensor
DQA130.1	Rain gauge

Read more about KME103 in LSI LASTEM Professional Weather station data sheet.

Kit 1.0 Sensor array with 4-20 mA output

The most typical meteorological sensor array for AQM applications in a preconfigured kit: Air temperature & Relative humidity, Wind speed&direction, Global radiation, Pressure and Rain.
Includes cables and arms for installation on pole (45-65 mm diameter, pole not included).

Code	Description	KIT 1.0
	Combined wind speed and wind direction sensor, 4-20 mA output	Note 1
DNA821	Wind speed&direction sensor output 2x4-20 mA, power supply 10-30 Vdc/Vac. Rotor+Vane included	
DWA510	Cable L = 10 m for DNA821	
DWA525	Cable L = 25 m for DNA821	Note 3
	Wind speed sensor, 4-20 mA output	
DNA801	Wind speed sensor, 4..20 mA output, power supply 10-30 Vdc/Vac. Rotor included	●
DNA802	Heated wind speed sensor, 4..20 mA output, power supply 24 Vac/dc. Rotor included	Note 2
DWA510	Cable L = 10 m for DNA801, DNA802	●
DWA525	Cable L = 25 m for DNA801, DNA802	Note 3
	Wind direction sensor, 4-20 mA output	
DNA810	Wind direction sensor, 4..20 mA output, power supply 10-30 Vdc/Vac. Vane included	●
DNA811	Heated wind direction sensor, 4..20 mA output, power supply 24 Vac/dc. Vane included	Note 2
DWA510	Cable L = 10 m for DNA810, DNA811	●
DWA525	Cable L = 25 m for DNA810, DNA811	Note 3
DYA046	Mounting arm “T” shape for wind speed and wind direction sensors	●
	Temperature and Relative Humidity sensor, 4-20 mA output	
DMA875	Natural ventilated T°C+RH% probe (select..output: 0/4-20mA). Power supply 10-30 Vdc/Vac	●
DMA867	Aspirated T°C+RH% probe (select..output: 0/4-20mA). Power supply 10-30 Vdc/Vac	Note 4
DYA049	Collar for fixing DMA875, DMA867 to pole diam. 45-65 mm	●
DWA510	Cable L = 10 m for DMA875, DMA867	●
	Global solar radiation sensor, 4-20 mA output	
DPA854	First class pyranometer, (select output: 0/4-20 mA). Power supply 10-30 Vac/Vdc	●
DPA860	Second class pyranometer, (select output: 0/4-20 mA). Power supply 10-30 Vac/Vdc	Note 5
DYA049	Collar for fixing DMA854, DMA860 to pole diam. 45-65 mm	●
DWA510	Cable L = 10 m for DNA854, DNA860	●
DWA525	Cable L = 25 m for DNA854, DNA860	Nota 3

continued

Code	Description	KIT 1.0
	Rain gauge	
DQA130.1#C	Rain gauge 333 sq.cm inlet area, aluminum made. Calibration Certificate included	●
DQA131.1#C	Heated rain gauge 333 sq.cm inlet area, aluminum made. Calibration Certificate included	Note 2
DWA510	Cable L = 10 m for DQA130.1#C, DQA131.1#C	●
DYA040	Tripod for rain gauge mounting on DYA058 bar	●
DYA058	Bar for rain gauges mounted on the lateral side of the Ø 45÷65 mm pole	●
DEA280	Integrator converter for rain gauges. 0..20 mm rain /4..20 mA, power supply 24 Vac	● Note 6
DEA285	Integrator converter for rain gauges. 0..20 mm rain /4..20 mA, power supply 12 Vdc	Note 7
	Barometer	
DQA201	Barometer, range 800÷1100 hPa, 4÷20 mA output, power supply 24 Vca	●
DQA202	Barometer, range 800÷1100 hPa, 4÷20 mA output, power supply 12 Vdc	Note 8

Note 1 Alternative to separate wind speed and wind direction sensors. The main advantage is a simpler installation, with a single cable and without theneed for the “T” shape mounting arm. This sensor has a slightly higher threshold than the separate units and there is not heater system available on this model.

Note 2 Heated versions are required to guarantee sensor functioning in cold weathers, where the ice could block the rotors movements of the wind sensors. In the case of rain gauge, the heated version assure the melting of the snow and the tipping bucket operation in subzero conditions.

Note 3 Usually, longer cables are required when wind sensors are mounted on top of H.10 m towers

Note 4 Aspirated thermo-hygrometers maintain sensor accuracy in case of low winds and high radiation conditions, and are normally recommended for precise measurement of temperature difference between two levels (typically 2 m and 10 m).

Note 5 Alternative to First class pyranometer, where a lower accuracy is required. If the solar radiation data are to be used in procedures for estimating stability then second class pyranometers are normally acceptable.

Note 6 The unit converts the pulse signal from the rain gauge to 4-20 mA. Every tip increase the mA value until reaching 20 mA, after which it resets to 4 mA.

Note 7 Alternative to DEA280. 12 Vdc power supply.

Meteorological sensors
Technical features - MODELS

Combined Wind speed and Direction sensors

This sensor includes, in a single apparatus, transducers for both wind speed and wind direction measurement. Its use simplifies installation requirements, other than being smaller, lighter and cheaper than the general 2-sensors kit.

Order numb.	**DNA821**	
Wind speed	*Principle*	N. 32 step optoelectronic disk
	Measuring range	0-60 m/s
	Uncertainty	0÷3 m/s=1,5%, >3 m/s= 1%
	Threshold	0,26 m/s
	Delay distance	4,8 m (at 10 m/s) Acc to VDI3786 and ASTM 5096-96
	Resolution	0,07 m/s
Wind direction	*Principle*	See table above
	Measuring range	0-360° (0-355° DNA122#C)
	Uncertainty	1%
	Threshold	0,15 m/s
	Resolution	0,3°
	Delay distance	1,2 m (at 10 m/s) Acc to VDI3786 and ASTM 5366-96
	Damping coeff.	0,21 (at 10 m/s) Acc to VDI3786 and ASTM 5096-96
General information	*WS output*	4÷20 mA (0÷5 Vdc: DNA827 model)
	WD output	4÷20 mA (0÷5 Vdc: DNA827 model)
	Power supply	10÷30 Vac/dc
	Power consumption	0,5 W
	Wind direction principle	Hall effect sensor
	Wind speed principle	N.32 step optoelectronic disk
	Microprocessor	PIC 18F2620
	Connector	7 pin IP65 watertight connector
	Material	Housing: anodized aluminum Cup: PA6 plastic and fiberglass Vane: Aluminum
	Mounting	Mast ø 48 ÷ 50 mm
	Protections	Tranzorb and Emifilters
	Operative temperature	>-30°C (without ice)

Accessories

	DZC405	Calibration certificate
	DWA510	Cable L = 10 m
	DWA525	Cable L = 25 m
	DWA526	Cable L = 50 m
	DWA527	Cable L = 100 m
	MG2251	7 pin free female connector

Standard anemometer (analog output)

Wind speed sensor with analog signal output. All models are based on microprocessor technology: Every sensor has, on the basis of its particular geometry, different response on each point of his measuring range; the microprocessor adjusts the signal linearity at any wind speed value, obtaining a precise and stable output. DNA802 is equipped with heaters.

Order numb.	DNA801	DNA802
Output	4÷20 mA	4÷20 mA
Power supply	10÷30 Vac/dc	24 Vac/dc
Heater	-	YES
Heater operative temperature	-	>-20°C
Power consumption	0,5 W	20 W

Common features

Wind speed	*Principle*	N. 32 step optoelectronic disk
	Measuring range	0-50 m/s
	Threshold	0,36 m/s
	Uncertainty	0÷3 m/s=1,5%, >3 m/s= 1%
	Resolution	0,06 m/s
	Delay distance	4,8 m (at 10 m/s) Acc to VDI3786 and ASTM 5096-96
General information	*Connector*	7 pin IP65 watertight connector
	Housing	Anodized aluminum,
	Operative temperature	-35÷ +70°C (without ice)
	Mounting	Mast ø 48 ÷ 50 mm
	Microprocessor	PIC 18F2620

Accessories

Order numb.	
DYA046	Coupling bar for WS+WD sensors on ø 45 ÷65 mm pole
DZC405	Calibration certificate. Included in DNA301-302-304#C
DWA510	Cable for DNA80x. L = 10 m
DWA525	Cable for DNA80x. L = 25 m
DWA526	Cable for DNA80x. L = 50 m
DWA527	Cable for DNA80x. L = 100 m
MG2251	Free connector without cable

Standard wind vane (analog output)

Wind direction sensor with analog signal output. All models use a Hall-effect encoding system. DNA811 is equipped with heaters to avoid ice formation on its body in very cold environments.

Order numb.	DNA810	DNA811
Power supply	10÷30 Vac/dc	24 Vac/dc
Heater	-	YES
Heater operative temperature		>-20°C
Power consumption	0,5 W	20 W

Common features		
Wind speed	*Measuring range*	0÷360°
	Uncertainty	3°
	Threshold	0,15 m/s
	Delay distance	1,2 m (at 10 m/s) Acc to VDI3786 and ASTM 5366-96
	Damping coeff.	0,21 (at 10 m/s) Acc to VDI3786 and ASTM 5096-96
	Principle	Hall effect sensor
General information	*Output*	4÷20 mA
	Connector	7 pin IP65 watertight connector
	Housing	Anodized aluminum,
	Operative temperature	-35÷ +70°C (without ice)
	Mounting	Mast ø 48 ÷ 50 mm

Accessories	Order numb.	
	**DYA046**	Coupling bar for WS+WD sensors on ø 45 ÷65 mm pole
	DZC404	Calibration certificate
	DWA510	Cable for DNA80x. L = 10 m
	DWA525	Cable for DNA80x. L = 25 m
	DWA526	Cable for DNA80x. L = 50 m
	DWA527	Cable for DNA80x. L = 100 m
	MG2251	7 pin free female connector for DNA81x sensors

Thermo-hygrometer (analog output)

Instruments for accurate measurement of air temperature and relative humidity in severe outdoor environments.
On DMA875 model, an high efficency natural ventilation radiant screen (with special black painting on the lower surface of the plates) ensures that the sensing element is protected by sun rays for accurate air temperature readings. For even better results in low wind and high solar radiation conditions, model DMA867 is equipped with a forced ventilation screen.

Order numb.		DMA875 (1)	DMA867 (2)
Ventilation		Natural	Forced
Programmable output		0/4÷20 mA	
Power supply		10÷30 Vac/dc	
Power consumption		1 W	3 W
Common features			
Temperature	*Principle*	Pt100 1/3 DIN B	
	Measuring range	Programmable: -30÷+70°C, -50÷+50°C, -50÷+100°C,	
	Uncertainty	0,2°C (0°C)	
	Resolution	0,04°C	
	Response time (T90)	3 min. with filter, 20 sec. without filter (0,2 m/s air speed)	
Relative humidity	*Principle*	Capacitive	
	Measuring range	0-100%	
	Uncertainty	±1,5% RH (5-95%)	
	Response time (T90)	10 min. with filter, 1 min. without filter (0,2 m/s air speed)	
General Information	*Connector*	7 pin IP65 watertight connector	
	Protection type	IP65	
	Operative temperature	-40÷+80°C	
	Protections	Tranzorb and Emifilters	
Accessories	**Order numb.**		
	DZC301.S	Calibration certificate	
	DYA049	Mast-mounting device for ø 45-65 mm pipe	
	DWA510	Cable L = 10 m	
	DWA525	Cable L = 25 m	
	DWA526	Cable L = 50 m	
	DWA527	Cable L = 100 m	
	MG2251	7 pin free female connector	

Pyranometers

Radiometer for solar irradiance measurement, according to ISO 9060 and WMO No. 8 (Part I, Chapter 7) standards.

Order numb.	DPA854 (1)	DPA860 (2)
Type	First class WMO (ISO9060)	Second class WMO (ISO9060)
Uncertainty(daily totals).	5%	10%
Response time (T95)	27 sec	30 sec
Spectral range	300÷3000 nm	305÷2800 nm

Common features

Pyranometer	*Principle*	Thermopile
	Measuring Range	0÷1500 W/m²
General information	*Output*	0/4÷20 mA
	Power supply	10÷30 Vac/dc
	Installation (on ø 45÷65 mm pole)	Using DYA049 collar
	Housing	Anodized aluminum
	Recalibration	Every 2 years
	Cable	7 pin IP65 connector

Accessories	Order numb.	
	DYA049	Mast-mounting device for ø 45-65 mm pipe
	DWA510	Cable L = 10 m
	DWA525	Cable L = 25 m
	DWA526	Cable L = 50 m
	DWA527	Cable L = 100 m
	MG2251	7 pin free female connector

Net radiometer

Net radiometers are sensors for measuring net radiation, i.e. the balance between the incoming sun and sky radiation and the ground-reflected short-wave and ground-emitted long-wave radiation. The primary sensitive element is a high sensitivity thermopile.

Order numb.	**DPA840**	
	Output	0/4÷20 mA
	Power supply	10÷30 Vac/dc
	Range	-150÷1500 W/m2
	Cable	7 pin IP65 watertight connector
	Installation (on ø 50 mm pole)	Using DYA051
	Data logger compatibility	
Pyranometer	*Principle*	Thermopile
	Spectral range	0,3÷50 µm
	Uncertainty	5% daily
General information	*Housing*	Plated brass and Aluminum
	Recalibration	Every 2 years

Accessories	**Order numb.**	
	DYA049	Mast-mounting device for ø 45-65 mm pipe
	DWA510	Cable L = 10 m
	DWA525	Cable L = 25 m
	DWA526	Cable L = 50 m
	DWA527	Cable L = 100 m
	MG2251	7 pin free female connector

UV-A, UV-B radiometers

Radiometers with broad spectral response for measuring of atmospheric irradiance in the UV-A and UV-B spectrum. The sensing element is a photodiode with optical filter with interferential deposition in order to improve spectral transmission. A High-quality dome and diffuser improves cosine response for radiations coming from lower angles.

Order numb.	DPA816	DPA821
Measurement	UV-A	UV-B
Measuring range	0÷70 W/m²	0÷5 W/m²
Spectral range	315÷400 nm	280÷315 nm
Uncertainty	12% daily	15% daily

Common features		
Sensor	*Principle*	Photodiode
General information	*Output*	0/4÷20 mA
	Power supply	10÷30 Vac/dc
	Power consumption	0,7 W
	Housing	Anodized aluminum
	Recalibration	Every 2 years
	Cable	7 pin IP65 watertight connector
	Installation (on ø 45÷65 mm pole)	Using DYA049 collar

Accessories	Order numb.	
	DYA049	Mast-mounting device for ø 45-65 mm pipe
	DWA510	Cable L = 10 m (DPA816)
	DWA525	Cable L = 25 m (DPA816)
	DWA526	Cable L = 50 m (DPA816)
	DWA527	Cable L = 100 m (DPA816)
	MG2251	7 pin free female connector

Rain gauge

Rain gauge is the instrument for the measuring of rain quantity. The device is composed of a collector cone and a double-chamber tipping bucket connected to a magnet that operates one reed switch, which generates impulses that can be counted by external meters: each impulse is equal to 0.2 mm of rainfall (optional 0.1 and 0,5 mm). The external body is made of anodized aluminum.
The rain gauge can either be installed directly on the ground (by means of DYA039 base plate) or be top-mounted (using DYA040 tripod) or side-mounted (using DYA058+DYA040) on 50 mm diameter meteorological masts. For sites with sub-zero temperatures, the thermostatic heated models (DQA131#C) ensure the complete melting of snow, even at extreme temperatures, and avoid ice formation on its body.

Order numb.	**DQA130.1#C**	**DQA131.1#C**
Diameter	200 cm	
Inlet area	324 cmq	
Heater	NO	YES
Heater power supply	-	24 Vac
Heater power consumption	-	60 W
Operative temperature	>0°C	>-20°C
Weight	2,8 Kg	

Common features

Rain gauge	*Principle*	Tipping bucket
	Design	WMO accordance
	Resolution	0,2 mm (opt. 0,1 mm)
	Uncertainty	Rain intensity 0÷1 mm/min: ± 0,2 mm Rain intensity 1÷10 mm/min: 1%
	Output	Pulses 0,1 A/24V non inductive
	Housing	Aluminum
	Weight	2,8 Kg
	Calibration certificate	Included

Accessories	**Order numb.**	
	DYA039	Base plate for ground installation
	DYA040	Mast-mounting device for ø 50 mm pipe
	DYA058	Lateral support. Requires DYA040
	DWA510	Cable L = 10 m
	DWA525	Cable L = 25 m
	DWA526	Cable L = 50 m
	DWA527	Cable L = 100 m
	MG2251	7 pin free female connector
	DEA280	Integrator for DQA130#C/131#C Range: 0-20 mm. Output: 4-20 mA Power supply: 24 Vac
	DEA285	Integrator for DQA130#C/131#C Range: 0-20 mm. Output: 4-20 mA Power supply: 12 Vdc
	DEA282	Integrator for DQA130#C/131#C Range: 0-20 mm. Output: 0-5 Vdc Power supply: 24 Vac

Pressure sensors

Sensors designed for accurate measurement of atmospheric pressure and integration with third party acquisition systems requiring standard analogue output. Calibration is made using trimmers.
DQA223 model uses a thermo compensation system to reduce the thermal effect on the pressure measurement. Furthermore on this model different analogue outputs are locally selectable with dip-switches.

Order numb.	DQA201	DQA202	DQA208	DQA223
Principle	Piezoelectric			
Range	800÷1100 hPa			
Maximum pressure limit	2000 hPa			
Protection	IP43			
Output	4÷20 mA		0÷5 Vdc	Programmable 0/4÷20 mA, 0/1÷5 V, 0/60÷300 mV
Power supply	24 Vac	12 Vdc		
Power consumption	1 W			40 mA
Uncertainty	1 hPa			
Thermal drift	0,1 hPa/°C (-10÷+60°C)			0,01 hPa/°C (-10÷+60°C)

Calculator

For a pre-elaboration of the meteorological data, LSI LASTEM can supply a data acquisition system with built-in environmental and arithmetical functions (ELO105).ELO105 can be connected to the existing data logger on the AQMS or CEMS to simplify data analysis.
Specific pre-elaborations available on the ELO105 calculator include:

- Delta T from two temperature sensors
- Dew Point temperature
- Wind elaborations, optimized for stability categories determination: Prevalent sector, Resultant wind speed, Standard Deviation of the wind direction. Percentage of calm.

In addition it can be useful to adopt the ELO105 calculator for the following reasons:

- Modbus RTU or TTY data output
- Back-up memory system
- Independent meteorological measurement data storage for air quality model predictions.

ELO105 calculator can be connected to a liter range of sensors (without standard 4-20 mA output) which are generally cheaper than the 4-20 mA output sensor version.
ELO105 can be sold as separate accessory or inside a sales kit (KMExxx) including also meteorological sensors, as following:

continued

	ELO105	Calculator, power supply 12 Vdc, memory 2 Mb, n. 2 RS232 ports
	DNA202	Wind speed sensor
	DNA212	Wind direction sensor
	DMA672.1	Temperature and Relative Humidity sensor
	DYA233	Radiant screen for DMA672.1
	DPA053	Second class (ISO9060) pyranometer
	DQA240.1	Atmospheric pressure sensor
	DQA130.1	Rain gauge Mounting arms
	Read more about KMExxx sales kit on MW9044 data sheet.	

Order numb.	**ELO105**	
Analog inputs	*Number*	N. 8
	ESD protection	±8 kV contact discharge IEC 1000–4-2
	Max input signal	1,2 V
	EMC filters	on all inputs
Digital inputs	*Number*	N. 4
Digital output	*Use*	Sensors and communication devices power supply
	Number	N. 7
	Mas load on every output	150 mA
	Protection	Thermal and over current (> 0.15 A)
Power supply	*Power supply*	12 V ± 10%
	Power consumption (Stand-by)	0,2 mA (20 mA during acquisition)
	Protection	Transient voltage suppressor: 600 W, t = 10 µs; inversion polarity
Other	*Elaborations*	Min/Ave/Max/St.Dev, Totals over programmable time base
	Calculation	- Wind elaborations: resulting/prevailing direction, resulting speed, direction standard deviation (sigma-theta), calm. - Math channels
	Protocols	- TTY: instantaneous values (spontaneous or by external request); - Modbus RTU: instantaneous values and diagnostic information
	RS-232 ports	N. 2x9 pins/Female/Male/DTE/DCE, 1200 ÷ 115200 bps
	Watch	30 sec/month accuracy (T=25°C)
	Environmental limits	-40 ÷ 60 °C, 15 ÷ 100 % UR/RH (without condensation)
	Protection	IP 40
	Weight	720 g
	Dimensions	242 x 108 x 80 mm

Reference List

Meteorological sensors for atmospheric dynamics analysis in Air Quality Monitoring (AQM) systems and networks

Some of the customers who choose our systems:

Italy:

System integrators

-**Project Automation** - Milano
-**Orion** - Padova
-**Sartec** - Milano

EMAL - UAE
(Courtesy of Envirozone LLC)

Halul Island - Qatar
(Courtesy of Envirozone LLC)

Research and development

-**Università di Salerno** - SEED Ingegneria Sanitaria Ambientale - Salerno
-**Università di Napoli Federico II** - Ingegneria - Salerno

End users

-**ARPA Lombardia**
-**ARPA Veneto**
-**Reckitt Benckiser** - Venezia
-**Eco Energy** - Venezia
-**Ente della Zona Industriale di Porto Marghera** Venezia
-**Acegas Aps** - Inceneritore - Trieste
-**Enel Spa** – Roma
-**ENI Spa** – Roma

CETESB San Paulo - Brazil
(Courtesy of CETSB)

MINSAL Santiago - Chile
(Courtesy of Esetec EIRL)

Foreign countries:

Dukhan - Qatar
(Courtesy of Envirozone LLC)

Egzia - Algeria
(Courtesy of Environnement SA)

AIR QUALITY SYSTEM MANUFACTURERS

-**Environnement SA** - France
-**Seres** - France
-**Opsis** - Sweden

SYSTEM INTEGRATORS

-**MLU** - Austria
-**EAS Envimet** - Austria
-**Envitec BV** – Belgium
-**CCS OOD** - Bulgaria
-**JB Cambas** - Greece
-**Envitech Ltd** - Israel
-**Kenvitech** - Korea
-**SC Orion Europe** - Romania
-**Greenlab** – Hungary
-**RSI** - Romania
-**Kinetics** - Thailand
-**Petro** - Thailand
-**Envirozone** - UAE
-**Grouptek** – Kuwait
-**Titas** - Turkey
-**JCTM** - Brasil

Bucarest Municipality - Romania
(Courtesy of RSI Electro Srl)

Bucarest municipality - Romania
(Courtesy of Environnement SA)

Salvador de Bahia - Brazil
(Courtesy of Environnement SA)

Aqaba - Jordan
(Courtesy of Environnement SA)

Inea Rio de Janeiro - Brazil
(Courtesy of Environnement SA)

Kuwait City - Kuwait
(Courtesy of Environnement SA)

ANCAP Montevideo - Uruguay
(Courtesy of Durandal)

FINAL USER

-**EGZIA AQMS** – Algeria
-**CETESB** – Brazil
-**Petrobras** – Brazil
-**INEA** - Rio de Janeiro - Brazil
-**Cetrel Salvador de Bahia** – Brazil
-**Curitiba** – Brazil
-**Raizen Combustiveis S.A.** – Brazil
-**MINSAL** - Chile
-**AQMS Network** - Hungary
-**Sohar Port Oman**
-**Korea AQMS network** - Korea
-**Lituania AQMS Network** - Lithuania
-**CFE Mexico AQMS network** - Mexico
-**Poland AQMS Network** - Poland
-**Lafarge** - Philipines
-**EMB** - Philipines
-**Agroleico** - Portugal
-**Quatar University** – Quatar
-**Bucarest Municipality** - Romania
-**AQABA** - Jordan
-**Al Arfaj Mobile** - Kuwait
-**AQMS Network** - Kuwait
-**KOC** - Kuwait
-**Al Wasea** - Saudi Arabia
-**Dubai Federal Environmental Agency** (UAE)

Petrobras Rio de Janeiro - Brazil
(Courtesy of JCTM)

Middle east
(Courtesy of OPSIS)

AIR QUALITY MEASUREMENT SYSTEMS **(AQMS)**

Milano
ITALY

via Ex SP. 161 Dosso, 9
20090 Settala (MI) Italy
tel: +39 02 95 41 41
fax: +39 02 95 77 05 94
e-mail: info@lsi-lastem.it
web site: www.lsi-lastem.it