

Derived Quantities

LSI LASTEM data loggers include an internal library of formulas used to calculate a wide range of environmental variables. These values are derived from measured parameters, manual inputs, and other previously calculated quantities.

Derived Quantities	Manual input by operator	Automatic inputs from measurements	E-LOG ALIEM	M-LOG (ELO009)
Absolute Humidity (VDI3786 Part 4)		<ul style="list-style-type: none"> Temperature (°C) Relative Humidity (%) 	X	X
Air changes "1997 ASHRAE Fundamentals Handbook"- fluid flow	<ul style="list-style-type: none"> Room volume (m³) Pipe dimensions (cm²) Pipe factor 	Air speed (m/s)	X	X
Air flow (mass, volume) "1997 ASHRAE Fundamentals Handbook"- fluid flow	<ul style="list-style-type: none"> Pipe dimension (cm²) Pipe factor 	<ul style="list-style-type: none"> Air speed (m/s) Temperature (°C) Pressure (hPa) for mass air flow only (kg/h) 	X	X
Air speed (using Pitot and darcy tubes)	Pitot or Darcy constant value	<ul style="list-style-type: none"> Differential pressure (hPa) Absolute pressure (hPa) Air temperature (°C) 	X	X
Absolute Pressure (sea level)	Altitude	<ul style="list-style-type: none"> Absolute pressure (hPa) Temperature (°C) Relative Humidity (%) 	X	X
Dew Point (ISO7726)		<ul style="list-style-type: none"> Temperature (°C) Relative Humidity (%) 	X	X
Heat index (1990 National Weather Service. Technical Attachment SR 90-23)		<ul style="list-style-type: none"> Temperature (°C) Relative Humidity (%) 	X	X
Evaporation	Maximum water level (mm)	Water level (mm)	X	
Mean Radiant Temperature (ISO7726)		<ul style="list-style-type: none"> Radiant Temperature (°C) Air temperature (°C) Air speed (m/s) 	X	X
Radiant temperature asymmetry (ISO7726)		<ul style="list-style-type: none"> Radiant Temperature (°C) Air temperature (°C) Air speed (m/s) 	X	X
Operative Temperature (ISO7726)		<ul style="list-style-type: none"> Radiant Temperature (°C) Air temperature (°C) 	X	X
Plane Radiant Temperature 1&2 (ISO7726)	Sensor orientation (cold/warm wall, cold/warm floor)	<ul style="list-style-type: none"> Net radiation (W/m²) Sensor temperature (°C) 	X	X
Partial vapor pressure (ISO7726: Table D.1 Humidity conver.equations)		<ul style="list-style-type: none"> Temperature (°C) Relative Humidity (%) 	X	X
Psychrometric Humidity (ISO7726)	<ul style="list-style-type: none"> Psychrometric coefficient Standard pressure (if measurement of absolute pressure is not present) 	<ul style="list-style-type: none"> Dry bulb temperature (°C) Wet bulb temperature (°C) Absolute pressure (hPa) (if present) 	X	X

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Specific Humidity (VDI3786 Part 4)		<ul style="list-style-type: none"> Temperature (°C) Relative Humidity (%) Absolute pressure (hPa) 	X	X
Sunshine Duration	Sunshine threshold	Direct radiation (W/m ²)	X	X
TCH - Chill temperature (ISO TR11079)		<ul style="list-style-type: none"> Temperature (°C) Air speed (m/s) 	X	X
Wet bulb Temperature (ISO7726)		<ul style="list-style-type: none"> Temperature (°C) Relative Humidity (%) Absolute pressure (hPa) 	X	X
UV exposition		<ul style="list-style-type: none"> UV-A radiation (W/m²) UV-B radiation (W/m²) 	X	X
UV index		<ul style="list-style-type: none"> UV-A radiation (W/m²) UV-B radiation (W/m²) 	X	X
Wind Chill index (ISO TR 11079)		<ul style="list-style-type: none"> Temperature (°C) Air speed (m/s) 	X	X
WBGT index IN+OUT formulas (ISO7243)		<ul style="list-style-type: none"> Outdoor air temperature (°C) Black globe temperature (°C) Wet temperature natural ventilation (°C) 	X	X
% dissatisfied by floor temperature (ISO7730)		Floor temperature (°C)	X	X
% dissatisfied by vertical temperature (ISO7730)		<ul style="list-style-type: none"> Ankle air temperature @ H.10 cm (°C) Air temperature @ H.110 cm (°C) 	X	X
% dissatisfied by radiant asymmetry (ISO7730)	Sensor orientation (cold/warm wall, cold/warm floor)	<ul style="list-style-type: none"> Net radiation (W/m²) Sensor temperature (°C) 	X	X
% dissatisfied by air draw (ISO7730)		<ul style="list-style-type: none"> Turbulence index (TU using ESV306) Air temperature (°C) Air speed (m/s) 	X	X
Daylight factor (IESNA Lighting handbook)		<ul style="list-style-type: none"> Indoor lighting (lx) Outdoor lightning (lx) 	X	X
Light intensity	Distance from luminous source	Lightning (lx)	X	X
Estimated Natural Decay of SARS-CoV-2 on surfaces (stainless steel and ABS plastic) under a range of temperatures and relative humidity (proposed by DHS and S&T, USA)	Decay factor K: <ul style="list-style-type: none"> 1 (50%) 13,29 (99.99%) 19,94 (99.9999%) 26,58 (99.999999%) 	<ul style="list-style-type: none"> Temperature (°C) Relative Humidity (%) 		X

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Math formulas				
Sum/Difference/ Multiplication/Division			X	X
Difference between two previous values			X	X
Integral/Mean/Elevation to power/Exponential/ Logarithm/ Base 10 logarithm/Square root			X	X
Mobile Maximum/Mobile Minimum/Mobile Average/ Mobile Total			X	X
Vectorial calculations specific for anemometric quantities (WMO N°8, cap. 5.8)				
Average direction (Prevailing)		Wind direction	X	X
Resulting average direction		<ul style="list-style-type: none"> • Wind direction • Wind speed 	X	X
Resulting average speed		<ul style="list-style-type: none"> • Wind direction • Wind speed 	X	X
Direction standard deviation		Wind direction	X	X
Calm wind percentage		Wind speed	X	X

Alpha-Log

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Dew point (ISO 7726)		<ul style="list-style-type: none"> Air temperature (°C) Relative humidity (%)
Psychrometric Humidity (ISO7726)	<ul style="list-style-type: none"> Psychrometric coefficient Standard pressure (if measurement of absolute pressure is not present) 	<ul style="list-style-type: none"> Dry bulb temperature (°C) Wet bulb temperature (°C) Absolute pressure (hPa)
Sun position (height and azimuth) ("Astronomical Algorithms, Willmann-Bell, Inc., Richmond, VA" Book by Jean Meeus)	<ul style="list-style-type: none"> Latitude Longitude Date/time 	
Diffuse solar radiation (WMO - Guide Nr. 8, Chapt. 8, eq. 8.2)		<ul style="list-style-type: none"> Global solar radiation (W/m²) Direct solar radiation (W/m²) Sun elevation angle (deg) (calculated)
Sunshine presence (WMO - Guide Nr. 8, Chapt. 8.1)		Direct solar radiation (W/m ²)
Sunshine presence (Step Algorithm, "Updating and development of methods for worldwide accurate measurements of sunshine duration - Vuerich, Morel, Mevel, Olivieri")		<ul style="list-style-type: none"> Global solar radiation (W/m²) Sun elevation angle (deg) (calculated)
Sunshine presence (MeteoFrance Algorithm, "Updating and development of methods for worldwide accurate measurements of sunshine duration - Vuerich, Morel, Mevel, Olivieri")	<ul style="list-style-type: none"> Coeff. A Coeff. B 	<ul style="list-style-type: none"> Global solar radiation (W/m²) Sun elevation angle (deg) (calculated) Date/time
Daily Evapo-transpiration (Penman-Monteith eq., "Crop evapotranspiration - Guidelines for computing crop water requirements - FAO Irrigation and drainage paper 56", Chapt. 2)	<ul style="list-style-type: none"> Latitude Altitude (m) Height of the wind velocity measurement (m) Global solar radiation (W/m²) (instead of Net solar radiation if absent) 	<ul style="list-style-type: none"> Air temperature (°C) Relative humidity (%) Wind velocity (m/s) Net solar radiation (W/m²) (if present)
Barometric pressure (QNH, ref. ICAO) (Tab. 3.10 from "International Meteorological Tables – WMO No. 188 TP. 94 – 1966")	<ul style="list-style-type: none"> Coeff. A Coeff. B 	Atmospheric Pressure (hPa)
Barometric pressure (QNH ref. ICAO) (ISA eq. 7, CIMO, "CIMO/ET-Stand-1/Doc. 10 (20.XI.2012)")	Altitude (m)	Atmospheric Pressure (hPa)
Barometric pressure (QNH ref. ICAO) (ICAO eq. 28/29, "CIMO/ET-Stand-1/Doc. 10 (20.XI.2012); ICAO documents 7488/9837")	Altitude (m)	Atmospheric Pressure (hPa)
WBGT index IN+OUT formulas (ISO7243)		<ul style="list-style-type: none"> Outdoor air temperature (°C) Black globe temperature (°C) Wet temperature natural ventilation (°C)

Alpha-Log

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Cross Wind (ICAO doc. 8896, AN/893)	Runway angle respect to the North (°)	<ul style="list-style-type: none"> • Wind velocity (m/s) • Wind direction (m/s)
Head Wind (ICAO doc. 8896, AN/893)		
Tail wind (ICAO doc. 8896, AN/893)		
Stability category Pasquill-Gifford (SRDT method, "Bowen, Dewart, Chen, 1983. Stability Class Determination: A Comparison for one site. Proceedings 6 th Symposium on Turbulence and Diffusion, American Meteorological Society")	Radiation threshold day/night (W/m ²)	<ul style="list-style-type: none"> • Wind velocity (m/s) • Solar radiation (W/m²) • Lower air temperature (°C) • Upper air temperature (°C)
Gravimetric water content (VDI 3477 - Biological waste gas purification - Biofilters)	Density of the dry part (kg/dm ³)	Fraction of gravimetric water content (-)
Universal Thermal Climate Index (UTCI) (International Society of Biometeorology ISB)		<ul style="list-style-type: none"> • Air temperature (°C) • Dew point (or relative humidity) (°C) • Wind speed (m/s) • Mean radiant temperature (°C)
Math formulas		
Sum/Difference/Multiplication/Division		
Difference between two previous values		
Integral/Mean/Elevation to power/ Exponential/Logarithm/ Base 10 logarithm/Square root		
Mobile Maximum/Mobile Minimum/Mobile Average/Mobile Total		
Vectorial calculations specific for anemometric quantities (WMO N°8, cap. 5.8)		
Average direction (Prevailing)		Wind direction
Resulting average direction		<ul style="list-style-type: none"> • Wind direction • Wind speed
Resulting average speed		<ul style="list-style-type: none"> • Wind direction • Wind speed
Direction standard deviation		Wind direction
Calm wind percentage		Wind speed