OTT HydroMet

Lufft
an OTT HydroMet brand

OTT HydroMet Fellbach GmbH | Gutenbergstraße 20 | 70736 Fellbach | Deutschland | +49 711 51822 0 | met-info@otthydromet.com | www.otthydromet.com

FAT Certificate & Protocol – Smart Weather Sensor

Model type	**WS501-UMB**	
Serial number	**787.0924.1009.251**	

This is to certify, that this Lufft branded product has been tested according to the QM of the OTT HydroMet Fellbach GmbH manual in accordance with DIN EN ISO 9001. Ordering specifications are complied with. Execution of instruments / systems as well as testing of accuracy was carried out following OTT HydroMet quality assurance procedures. Quality inspection was successfully passed. This Lufft product has been calibrated according to specifications using references traceable to international standard units administrated by the national metrology institutes like PTB, NIST, NPL or other recognized national standard laboratories.

Measurements

	Reference value	*Observed value*	*Error*	*Status*
Relative humidity	**15.0 % RH**	**15.0 % RH**	**0.0 % RH**	✓
Relative humidity	**75.0 % RH**	**75.0 % RH**	**0.0 % RH**	✓
Temperature	**0.01 °C**	**0.01 °C**	**0.00 °C**	✓
Air pressure	**973.5 hPa**	**973.5 hPa**	**0.0 hPa**	✓
Radiation sensivity		**24.1 µV/W/m²**		✓

Serial number pyranometer: 241714

Wind direction and speed

Angular deviation (0° … 360° in steps of 22.5°)

	2.0 m/s	*5.0 m/s*	*10.0 m/s*	*20.0 m/s*	*50.0 m/s*	*Status*
RMSE	**0.4°**	**0.3°**	**0.6°**	**0.6°**	**0.7°**	✓

Wind speed

	2.0 m/s	*5.0 m/s*	*10.0 m/s*	*20.0 m/s*	*50.0 m/s*	*Status*
RMS	**2.0 m/s**	**5.0 m/s**	**10.0 m/s**	**20.0 m/s**	**49.9 m/s**	✓

This test certificate may not be reproduced other than in full except with the permission of the issuing company. Test certificates without signature are not valid.

Fellbach, 08.10.2024

Qualitätssicherung

Bearbeiter
Pe

i. A. Annemarie Galetzka

OTT HydroMet B.V. | Delftechpark 36 | 2628 XH Delft | The Netherlands | +31 15 2755 210 | solar-info@otthydromet.com | www.otthydromet.com

ISO/IEC 17025 CALIBRATION CERTIFICATE

CERTIFICATE NUMBER 031662241714

Calibration procedure

The indoor calibration procedure is based on a side-by-side comparison with a reference pyranometer under an artificial sun. A lamp is positioned approximately 1.5 m above the pyranometers producing a vertical beam. The reference and test pyranometer are mounted horizontally on a table which can rotate. The irradiance at the pyranometers is approximately 600 W/m². During the calibration procedure the reference and test pyranometer are interchanged to correct for any non-homogeneity of the beam. Temperature during calibration: 22 °C ± 2 °C.

Hierarchy of traceability

The measurements have been executed using standards for which the traceability to international standards has been demonstrated towards the RvA.

The reference pyranometer was compared with the sun and sky radiation as source under clear sky conditions using the "alternating sun-and-shade method" ISO 9846 paragraph 5. The measurements were performed in Davos, Switzerland (latitude: 46.8143°, longitude: 9.8458°, altitude: 1588m above sea level). Dates of measurements: August 22..25, September 1, 2023.
The receiver surface was pointed directly at the sun using a solar tracker. During the comparisons, the instrument received tilted global radiation intensities from 889 W/m² to 1070 W/m² with a mean of 1006 W/m² and tilted diffuse radiation intensities from 77 W/m² to 304 W/m² with a mean of 189 W/m². The ambient temperature ranged from +16.7 °C to +33.2 °C with a mean of +24.9 °C.
The direct radiation on the reference pyranometer as obtained with the alternating-sun-shade method was compared to the DNI measured by the absolute cavity pyrheliometer PMO6 SN 103. The PMO6 is calibrated against the World Standard Group (WSG), maintained at the WRC Davos every International Pyrheliometer Comparison (IPC). WRR factor of PMO6: 0.998913 (from the last IPC-2021).

This calibration proved that the reference pyranometer has been stable and that the original sensitivity 14.75 µV/(W/m²) ± 0.38 µV/(W/m²) is valid and will be applied (see PMOD calibration details). Observed sensitivity differences between the consecutive years are well within the calibration uncertainty.

PMOD calibration details: The reference pyranometer was compared with the sun and sky radiation as source under mainly clear sky conditions using the "continuous sun-and-shade method". The pyranometer was installed horizontally. During the comparisons, the global radiation ranged from 665 W/m² to 1082 W/m² with a mean of 897 W/m². The solar zenith angle varied from 25.3° to 50.0° with a mean of 33.7°. The ambient temperature ranged from +15.3 °C to +25.3 °C with a mean of +20.6 °C. The sensitivity calculation is based on 225 individual measurements. The readings of the WSG are referred to the World Radiometric Reference (WRR). The estimated uncertainty of the WRR relative to SI is ±0.3%. The obtained sensitivity value and its expanded uncertainty (95% level of confidence) are valid for similar conditions and are:14.75 ± 0.38 µV/W/m². The measurements were performed in Davos (latitude: 46.8143°, longitude: 9.8458°, altitude: 1558 m above sea level). Dates of measurements: 15-19, 25 July 2014. Global radiation data were calculated from the direct solar radiation as measured with the absolute cavity pyrheliometer PMO2 (member of the WSG, WRR- factor: 0.998623 from IPC-2010) and from the diffuse radiation as measured with a continuous disk shaded pyranometer Kipp & Zonen CM22 SN 020059 (ventilated with heated air).

SENSITIVITY	24.06 µV/(W/m²) at normal incidence on horizontal pyranometer
UNCERTAINTY	0.64 µV/(W/m²) = 2.64 %

Justification of total instrument calibration uncertainty

The combined uncertainty of the result of the calibration is the positive "root sum square" of the following components.
1. The expanded uncertainty due to random effects and instrumental errors during the calibration of the reference CMP 3 is ±0.38/14.75 = ±2.58% (k=2). See traceability text.
2. The expanded uncertainty of the transfer procedure (calibration by comparison) is estimated to be ±0.5% (k=2).
3. The estimated uncertainty of the WRR relative to SI: ±0.3% (k=2).
The expanded uncertainty is: $\sqrt{(2.58\%^2 + 0.5\%^2 + 0.3\%^2)} = \pm 2.64\%$ (k=2).

The reported expanded uncertainty is based on the standard uncertainty of the measurement multiplied by a coverage factor k, such that the coverage probability corresponds to approximately 95%. The standard uncertainty has been determined in accordance with EA 04/2.

Notice

The calibration certificate supplied with the instrument is valid at the date of first use. Even though the calibration certificate is dated relative to manufacture, or recalibration, the instrument does not undergo any sensitivity changes when kept in the original packing.

Expected instrument impedance**: 104 Ω ± 7.3 Ω

^ Instruments issued before October 2018 are classified conform to ISO 9060:1990.
** This impedance estimate can be helpful to check wire connections for shorts or open connections.

RvA is member of the European Co-operation for Accreditation (EA) and is one of the signatories to the EA Multilateral Agreement (MLA) and to the ILAC Mutual Recognition Arrangement (MRA) for the mutual recognition of calibration certificates.

Reproduction of the complete certificate is allowed. Parts of the certificate may only be produced with written approval of the calibration laboratory.

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ISO/IEC 17025 CALIBRATION CERTIFICATE

CERTIFICATE NUMBER	031662241714
PYRANOMETER MODEL	CMP 3
SERIAL NUMBER	241714
CALIBRATION DATE	23 August 2024
INSTRUMENT CLASS	ISO 9060, Class C*
CALIBRATION PROCEDURE	ISO 9847:2023 clause 6, type A1
REFERENCE PYRANOMETER	Kipp & Zonen CMP 3 sn 060193 active from 17 January 2024
REFERENCE PYRANOMETER CALIBRATION PROCEDURE	ISO 9846 par5
CALIBRATION LOCATION	Delft The Netherlands
CUSTOMER	

REMARKS

Delft, The Netherlands, 23 August 2024

J. Mes
(in charge of calibration facility)

M. Knoope
(in charge of test)

Lufft KIPP & ZONEN
Meteorology Division

OTT HydroMet

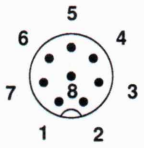
WSxxx Quickstart: Connection & First Check

Thank you for choosing our product. With this quickstart sheet, we would like to assist with connection, installation and first check of the smart weather sensor WSxxx.

Mounting of the WSxxx on a pole:

- For mounting of the sensor on a pole, a **combination wrench SW13** is required
- **WSxxx with wind sensor:** Every device with wind sensor must be **aligned to the North** in order to ensure correct wind measurement, or automatic compass correction must be activated – additional information to compass correction may be found in the WSxxx manual.

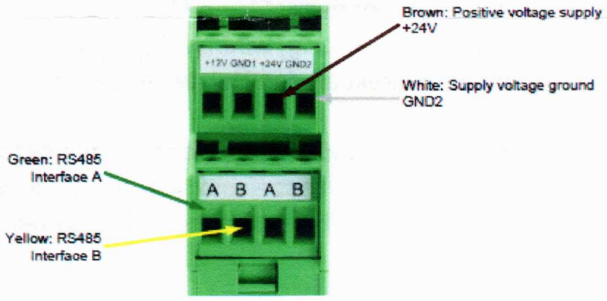
Connections & Pin assignment for using the UMB protocol:



1	White	Supply voltage ground	2	Brown	Positive supply volt. (12-24V)
3	Green	RS485_A (+)	4	Yellow	RS485_B (-)
5	Grey	External Sensor a	6	Pink	External Sensor b
7	Blue	Heating voltage ground	8	Red	Positive heating voltage

Note: If you do not use the UMB protocol, the pin assignment is changing. More detailed information on this subject may be found in the WSxxx manual.

Connection to ISOCON-UMB:



Warning: The heating voltage (red = positive heating voltage; blue = heating voltage ground) is not connected to the ISOCON-UMB but wired direct to the power supply unit.

When using surge protection, please pay attention to the connection example in the surge protection operating instructions.

First check of WSxxx after installation via Config-Tool.NET software:

1. Install Config-Tool.NET on the PC or laptop (Software available on https://www.lufft.com/downloads/)
2. Connect Com-Port PC/laptop with interface ISOCON-UMB (RS232-SUBD9 1:1)
3. Start program under: *Start → programs/Apps → Lufft → start Config-Tool.NET*
4. Create new Workspace *Choose new workspace -> Edit workspace*
5. Choose *Com-port and right serial connection settings*
6. Choose a name for the workspace and use button *"Scan device" and double click on the device WSx-UMB*
7. Update channel list with the *button "load channel list" and activate the desired channels in the menu "device" for the visualization*
8. Go back to the start menu and *activate the measurement with the button RUN/STOP*
9.



Manual of the Lufft smart weather sensor WSxxx:

The complete printed manual is part of the scope of delivery or you will find this as a download too under the following link: www.lufft.com/WSxxx/

Lufft KIPP & ZONEN
Meteorology Division

OTT HydroMet

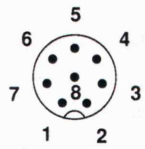
WSxxx Schnellstart: Kabelbelegung & Messdatenkontrolle

Vielen Dank, dass Sie sich für unser Produkt entschieden haben. Mit dieser Quickstart-Anleitung möchten wir Ihnen die ersten Schritte der Inbetriebnahme des Lufft WSxxx Wettersensors erläutern.

Montage der WSxxx:

- Zur Montage des Sensors wird ein **Gabel-Ringschlüssel SW13** benötigt
- **WS mit Windmessung**: Für die korrekte Windmessung muss das Gerät **nach Norden ausgerichtet** sein oder die automatische Kompass-Korrektur aktiviert sein – Nähere Informationen zur automatischen Kompass-Korrektur entnehmen Sie der Bedienanleitung.

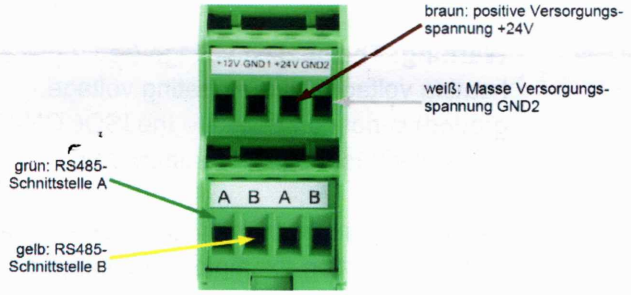
Kabelbelegung / Anschlüsse bei Verwendung des UMB-Protokolls:



1	Weiß	Masse Versorgungsspannung	2	Braun	Pos. Versorgungssp. (12-24V)
3	Grün	RS485_A (+)	4	Gelb	RS485_B (-)
5	Grau	Externer Sensor a	6	Rosa	Externer Sensor b
7	Blau	Masse Heizungsspannung	8	Rot	positive Heizungsspannung

Achtung: Falls zur Messdatenübertragung nicht das UMB-Protokoll verwendet wird, ergeben sich Änderungen in der Klemmbelegung. Hierzu finden Sie ausführliche Informationen in der Bedienanleitung.

Anschluss an ISOCON-UMB:



Achtung: Die Heizungsspannung (rot = positive Heizungsspannung; blau = Masse Heizungsspannung) wird nicht am ISOCON-UMB, sondern direkt an das Netzteil angeschlossen.

Bei der Verwendung des Überspannungsschutz bitte das Anschlussbeispiel aus der Betriebs-anleitung des Überspannungsschutzes beachten!

Messdatenkontrolle nach Installation mit Hilfe der Software Config-Tool.NET:

1. Installieren Sie das Config-Tool.NET auf Ihrem PC / Notebook (Software über die Website https://www.lufft.com/de-de/downloads/ verfügbar)
2. Verbinden Sie den COM-Port PC mit der Schnittstelle ISOCON-UMB (RS232-SUBD9-1:1)
3. Starten Sie das Programm über *Start→Programme/Apps→Lufft→start Config-Tool.NET*
4. Neuen Workspace anlegen über *„neuer Workspace“ -> Workspace bearbeiten*
5. Konfigurieren sie nun die richtigen COM-Port Einstellungen
6. Legen sie nun einen Namen für den Workspace an und drücken den Knopf *„Gerätesuche“ und klicken sie danach auf das Gerät „WSx-UMB“*
7. Aktualisieren sie nun die Kanalliste mit dem *Knopf „Kanalliste laden“ und aktivieren sie die gewünschten Kanäle zur Datenvisualisierung*
8. Gehen sie nun zurück zum Start Menü und *starten die Messung mit dem Knopf RUN/STOP*



Bedienanleitung der intelligenten Wettersensoren WSxxx:
Die gedruckte Bedienanleitung ist Teil des Lieferumfangs oder sie finden diese auch als Download über den folgenden Link: www.lufft.com/WSxxx/

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FAT Certificate & Protocol – Smart Weather Sensor

Model type	**WS501-UMB**	
Serial number	**771.0924.1009.251**	

This is to certify, that this Lufft branded product has been tested according to the QM of the OTT HydroMet Fellbach GmbH manual in accordance with DIN EN ISO 9001. Ordering specifications are complied with. Execution of instruments / systems as well as testing of accuracy was carried out following OTT HydroMet quality assurance procedures. Quality inspection was successfully passed. This Lufft product has been calibrated according to specifications using references traceable to international standard units administrated by the national metrology institutes like PTB, NIST, NPL or other recognized national standard laboratories.

Measurements

	Reference value	*Observed value*	*Error*	*Status*
Relative humidity	**15.0 % RH**	**15.0 % RH**	**0.0 % RH**	✓
Relative humidity	**75.0 % RH**	**75.0 % RH**	**0.0 % RH**	✓
Temperature	**0.01 °C**	**0.01 °C**	**0.00 °C**	✓
Air pressure	**973.5 hPa**	**973.5 hPa**	**0.0 hPa**	✓
Radiation sensivity		**23.8 µV/W/m²**		✓

Serial number pyranometer: 241715

Wind direction and speed

Angular deviation (0° … 360° in steps of 22.5°)

	2.0 m/s	*5.0 m/s*	*10.0 m/s*	*20.0 m/s*	*50.0 m/s*	*Status*
RMSE	**0.7°**	**0.4°**	**0.3°**	**0.3°**	**0.6°**	✓

Wind speed

	2.0 m/s	*5.0 m/s*	*10.0 m/s*	*20.0 m/s*	*50.0 m/s*	*Status*
RMS	**2.0 m/s**	**5.0 m/s**	**10.0 m/s**	**20.0 m/s**	**49.8 m/s**	✓

This test certificate may not be reproduced other than in full except with the permission of the issuing company. Test certificates without signature are not valid.

Fellbach, 08.10.2024

Qualitätssicherung

Bearbeiter
Pe

i. A. Annemarie Galetzka

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ISO/IEC 17025 CALIBRATION CERTIFICATE

CERTIFICATE NUMBER 031662241715

Calibration procedure

The indoor calibration procedure is based on a side-by-side comparison with a reference pyranometer under an artificial sun. A lamp is positioned approximately 1.5 m above the pyranometers producing a vertical beam. The reference and test pyranometer are mounted horizontally on a table which can rotate. The irradiance at the pyranometers is approximately 600 W/m². During the calibration procedure the reference and test pyranometer are interchanged to correct for any non-homogeneity of the beam. Temperature during calibration: 22 °C ± 2 °C.

Hierarchy of traceability

The measurements have been executed using standards for which the traceability to international standards has been demonstrated towards the RvA.

The reference pyranometer was compared with the sun and sky radiation as source under clear sky conditions using the "alternating sun-and-shade method" ISO 9846 paragraph 5. The measurements were performed in Davos, Switzerland (latitude: 46.8143°, longitude: 9.8458°, altitude: 1588m above sea level). Dates of measurements: August 22..25, September 1, 2023.
The receiver surface was pointed directly at the sun using a solar tracker. During the comparisons, the instrument received tilted global radiation intensities from 889 W/m² to 1070 W/m² with a mean of 1006 W/m² and tilted diffuse radiation intensities from 77 W/m² to 304 W/m² with a mean of 189 W/m². The ambient temperature ranged from +16.7 °C to +33.2 °C with a mean of +24.9 °C.
The direct radiation on the reference pyranometer as obtained with the alternating-sun-shade method was compared to the DNI measured by the absolute cavity pyrheliometer PMO6 SN 103. The PMO6 is calibrated against the World Standard Group (WSG), maintained at the WRC Davos every International Pyrheliometer Comparison (IPC). WRR factor of PMO6: 0.998913 (from the last IPC-2021).

This calibration proved that the reference pyranometer has been stable and that the original sensitivity 14.75 µV/(W/m²) ± 0.38 µV/(W/m²) is valid and will be applied (see PMOD calibration details). Observed sensitivity differences between the consecutive years are well within the calibration uncertainty.

PMOD calibration details: The reference pyranometer was compared with the sun and sky radiation as source under mainly clear sky conditions using the "continuous sun-and-shade method". The pyranometer was installed horizontally. During the comparisons, the global radiation ranged from 665 W/m² to 1082 W/m² with a mean of 897 W/m². The solar zenith angle varied from 25.3° to 50.0° with a mean of 33.7°. The ambient temperature ranged from +15.3 °C to +25.3 °C with a mean of +20.6 °C. The sensitivity calculation is based on 225 individual measurements. The readings of the WSG are referred to the World Radiometric Reference (WRR). The estimated uncertainty of the WRR relative to SI is ±0.3%. The obtained sensitivity value and its expanded uncertainty (95% level of confidence) are valid for similar conditions and are:14.75 ± 0.38 µV/W/m². The measurements were performed in Davos (latitude: 46.8143°, longitude: 9.8458°, altitude: 1558 m above sea level). Dates of measurements: 15-19, 25 July 2014. Global radiation data were calculated from the direct solar radiation as measured with the absolute cavity pyrheliometer PMO2 (member of the WSG, WRR- factor: 0.998623 from IPC-2010) and from the diffuse radiation as measured with a continuous disk shaded pyranometer Kipp & Zonen CM22 SN 020059 (ventilated with heated air).

SENSITIVITY	23.75 µV/(W/m²) at normal incidence on horizontal pyranometer
UNCERTAINTY	0.63 µV/(W/m²) = 2.64 %

Justification of total instrument calibration uncertainty

The combined uncertainty of the result of the calibration is the positive "root sum square" of the following components.
1. The expanded uncertainty due to random effects and instrumental errors during the calibration of the reference CMP 3 is ±0.38/14.75 = ±2.58% (k=2). See traceability text.
2. The expanded uncertainty of the transfer procedure (calibration by comparison) is estimated to be ±0.5% (k=2).
3. The estimated uncertainty of the WRR relative to SI: ±0.3% (k=2).
The expanded uncertainty is: $\sqrt{(2.58\%^2 + 0.5\%^2 + 0.3\%^2)} = \pm 2.64\%$ (k=2).

The reported expanded uncertainty is based on the standard uncertainty of the measurement multiplied by a coverage factor k, such that the coverage probability corresponds to approximately 95%. The standard uncertainty has been determined in accordance with EA 04/2.

Notice

The calibration certificate supplied with the instrument is valid at the date of first use. Even though the calibration certificate is dated relative to manufacture, or recalibration, the instrument does not undergo any sensitivity changes when kept in the original packing.

Expected instrument impedance**: 95 Ω ± 6.7 Ω

* Instruments issued before October 2018 are classified conform to ISO 9060:1990.
** This impedance estimate can be helpful to check wire connections for shorts or open connections.

RvA is member of the European Co-operation for Accreditation (EA) and is one of the signatories to the EA Multilateral Agreement (MLA) and to the ILAC Mutual Recognition Arrangement (MRA) for the mutual recognition of calibration certificates.

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ISO/IEC 17025 CALIBRATION CERTIFICATE

CERTIFICATE NUMBER	031662241715
PYRANOMETER MODEL	CMP 3
SERIAL NUMBER	241715
CALIBRATION DATE	23 August 2024
INSTRUMENT CLASS	ISO 9060, Class C*
CALIBRATION PROCEDURE	ISO 9847:2023 clause 6, type A1
REFERENCE PYRANOMETER	Kipp & Zonen CMP 3 sn 060193 active from 17 January 2024
REFERENCE PYRANOMETER CALIBRATION PROCEDURE	ISO 9846 par5
CALIBRATION LOCATION	Delft The Netherlands
CUSTOMER	

REMARKS

Delft, The Netherlands, 23 August 2024

Joop Mes

J. Mes
(in charge of calibration facility)

M. Knoope

M. Knoope
(in charge of test)

Lufft KIPP & ZONEN
Meteorology Division

OTT HydroMet

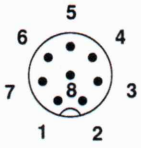
WSxxx Quickstart: Connection & First Check

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Mounting of the WSxxx on a pole:

- For mounting of the sensor on a pole, a **combination wrench SW13** is required
- **WSxxx with wind sensor:** Every device with wind sensor must be **aligned to the North** in order to ensure correct wind measurement, or automatic compass correction must be activated – additional information to compass correction may be found in the WSxxx manual.

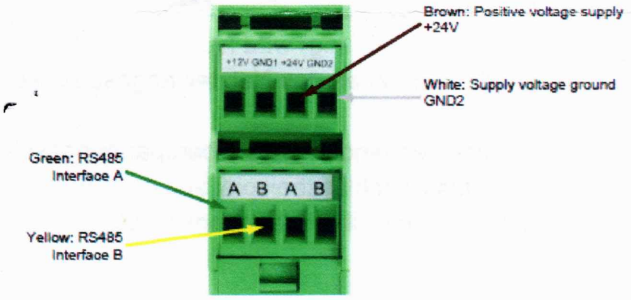
Connections & Pin assignment for using the UMB protocol:



1	White	Supply voltage ground	2	Brown	Positive supply volt. (12-24V)
3	Green	RS485_A (+)	4	Yellow	RS485_B (-)
5	Grey	External Sensor a	6	Pink	External Sensor b
7	Blue	Heating voltage ground	8	Red	Positive heating voltage

Note: If you do not use the UMB protocol, the pin assignment is changing. More detailed information on this subject may be found in the WSxxx manual.

Connection to ISOCON-UMB:



Warning: The heating voltage (red = positive heating voltage; blue = heating voltage ground) is not connected to the ISOCON-UMB but wired direct to the power supply unit.

When using surge protection, please pay attention to the connection example in the surge protection operating instructions.

First check of WSxxx after installation via Config-Tool.NET software:

1. Install Config-Tool.NET on the PC or laptop
   (Software available on https://www.lufft.com/downloads/)
2. Connect Com-Port PC/laptop with interface ISOCON-UMB (RS232-SUBD9 1:1)
3. Start program under: *Start → programs/Apps → Lufft → start Config-Tool.NET*
4. Create new Workspace *Choose new workspace -> Edit workspace*
5. Choose *Com-port and right serial connection settings*
6. Choose a name for the workspace and use button *"Scan device" and double click on the device WSx-UMB*
7. Update channel list with the *button "load channel list" and activate the desired channels in the menu "device" for the visualization*
8. Go back to the start menu and *activate the measurement with the button RUN/STOP*
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Manual of the Lufft smart weather sensor WSxxx:
The complete printed manual is part of the scope of delivery or you will find this as a download too under the following link: www.lufft.com/WSxxx/

Lufft KIPP & ZONEN
Meteorology Division

OTT HydroMet

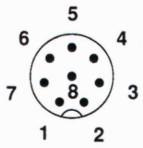
WSxxx Schnellstart: Kabelbelegung & Messdatenkontrolle

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Montage der WSxxx:

- Zur Montage des Sensors wird ein **Gabel-Ringschlüssel SW13** benötigt
- **WS mit Windmessung**: Für die korrekte Windmessung muss das Gerät **nach Norden ausgerichtet** sein oder die automatische Kompass-Korrektur aktiviert sein – Nähere Informationen zur automatischen Kompass-Korrektur entnehmen Sie der Bedienanleitung.

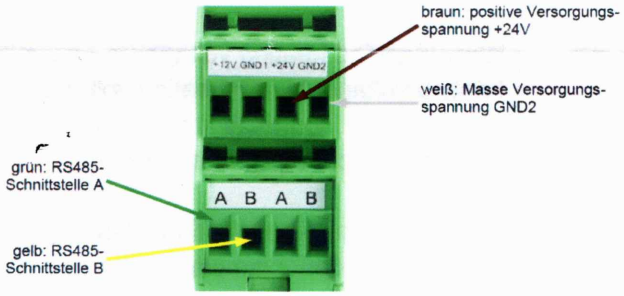
Kabelbelegung / Anschlüsse bei Verwendung des UMB-Protokolls:



1	Weiß	Masse Versorgungsspannung	2	Braun	Pos. Versorgungssp. (12-24V)
3	Grün	RS485_A (+)	4	Gelb	RS485_B (-)
5	Grau	Externer Sensor a	6	Rosa	Externer Sensor b
7	Blau	Masse Heizungsspannung	8	Rot	positive Heizungsspannung

Achtung: Falls zur Messdatenübertragung nicht das UMB-Protokoll verwendet wird, ergeben sich Änderungen in der Klemmbelegung. Hierzu finden Sie ausführliche Informationen in der Bedienanleitung.

Anschluss an ISOCON-UMB:



Achtung: Die Heizungsspannung (rot = positive Heizungsspannung; blau = Masse Heizungsspannung) wird nicht am ISOCON-UMB, sondern direkt an das Netzteil angeschlossen.

Bei der Verwendung des Überspannungsschutz bitte das Anschlussbeispiel aus der Betriebs-anleitung des Überspannungsschutzes beachten!

Messdatenkontrolle nach Installation mit Hilfe der Software Config-Tool.NET:

1. Installieren Sie das Config-Tool.NET auf Ihrem PC / Notebook (Software über die Website https://www.lufft.com/de-de/downloads/ verfügbar)
2. Verbinden Sie den COM-Port PC mit der Schnittstelle ISOCON-UMB (RS232-SUBD9-1:1)
3. Starten Sie das Programm über *Start →Programme/Apps →Lufft →start Config-Tool.NET*
4. Neuen Workspace anlegen über *„neuer Workspace" -> Workspace bearbeiten*
5. Konfigurieren sie nun die richtigen COM-Port Einstellungen
6. Legen sie nun einen Namen für den Workspace an und drücken den Knopf *„Gerätesuche" und klicken sie danach auf das Gerät „WSx-UMB"*
7. Aktualisieren sie nun die Kanalliste mit dem *Knopf „Kanalliste laden" und aktivieren sie die gewünschten Kanäle zur Datenvisualisierung*
8. Gehen sie nun zurück zum Start Menü und *starten die Messung mit dem Knopf RUN/STOP*



Bedienanleitung der intelligenten Wettersensoren WSxxx:
Die gedruckte Bedienanleitung ist Teil des Lieferumfangs oder sie finden diese auch als Download über den folgenden Link: www.lufft.com/WSxxx/

OTT HydroMet Fellbach GmbH | Gutenbergstraße 20 | 70736 Fellbach | Deutschland | +49 711 51822 0 | met-info@otthydromet.com | www.otthydromet.com

FAT Certificate & Protocol – Smart Weather Sensor

Model type	**WS501-UMB**	
Serial number	**791.0924.1009.251**	

This is to certify, that this Lufft branded product has been tested according to the QM of the OTT HydroMet Fellbach GmbH manual in accordance with DIN EN ISO 9001. Ordering specifications are complied with. Execution of instruments / systems as well as testing of accuracy was carried out following OTT HydroMet quality assurance procedures. Quality inspection was successfully passed. This Lufft product has been calibrated according to specifications using references traceable to international standard units administrated by the national metrology institutes like PTB, NIST, NPL or other recognized national standard laboratories.

Measurements

	Reference value	*Observed value*	*Error*	*Status*
Relative humidity	**15.0 % RH**	**15.0 % RH**	**0.0 % RH**	✓
Relative humidity	**75.0 % RH**	**75.0 % RH**	**0.0 % RH**	✓
Temperature	**0.01 °C**	**0.01 °C**	**0.00 °C**	✓
Air pressure	**973.3 hPa**	**973.3 hPa**	**0.0 hPa**	✓
Radiation sensivity		**26.2 µV/W/m²**		✓

Serial number pyranometer: 241608

Wind direction and speed

Angular deviation (0° … 360° in steps of 22.5°)

	2.0 m/s	*5.0 m/s*	*10.0 m/s*	*20.0 m/s*	*50.0 m/s*	*Status*
RMSE	**0.7°**	**0.7°**	**0.4°**	**0.6°**	**0.7°**	✓

Wind speed

	2.0 m/s	*5.0 m/s*	*10.0 m/s*	*20.0 m/s*	*50.0 m/s*	*Status*
RMS	**2.0 m/s**	**5.0 m/s**	**10.0 m/s**	**20.0 m/s**	**49.8 m/s**	✓

This test certificate may not be reproduced other than in full except with the permission of the issuing company. Test certificates without signature are not valid.

Fellbach, 08.10.2024

Qualitätssicherung

Bearbeiter
Pe

i. A. Annemarie Galetzka

OTT HydroMet B.V. | Delftechpark 36 | 2628 XH Delft | The Netherlands | +31 15 2755 210 | solar-info@otthydromet.com | www.otthydromet.com

ISO/IEC 17025 CALIBRATION CERTIFICATE

CERTIFICATE NUMBER 031545241608

Calibration procedure

The indoor calibration procedure is based on a side-by-side comparison with a reference pyranometer under an artificial sun. A lamp is positioned approximately 1.5 m above the pyranometers producing a vertical beam. The reference and test pyranometer are mounted horizontally on a table which can rotate. The irradiance at the pyranometers is approximately 600 W/m². During the calibration procedure the reference and test pyranometer are interchanged to correct for any non-homogeneity of the beam. Temperature during calibration: 22 °C ± 2 °C.

Hierarchy of traceability

The measurements have been executed using standards for which the traceability to international standards has been demonstrated towards the RvA.

The reference pyranometer was compared with the sun and sky radiation as source under clear sky conditions using the "alternating sun-and-shade method" ISO 9846 paragraph 5. The measurements were performed in Davos, Switzerland (latitude: 46.8143°, longitude: 9.8458°, altitude: 1588m above sea level). Dates of measurements: August 22..25, September 1, 2023.
The receiver surface was pointed directly at the sun using a solar tracker. During the comparisons, the instrument received tilted global radiation intensities from 889 W/m² to 1070 W/m² with a mean of 1006 W/m² and tilted diffuse radiation intensities from 77 W/m² to 304 W/m² with a mean of 189 W/m². The ambient temperature ranged from +16.7 °C to +33.2 °C with a mean of +24.9 °C.
The direct radiation on the reference pyranometer as obtained with the alternating-sun-shade method was compared to the DNI measured by the absolute cavity pyrheliometer PMO6 SN 103. The PMO6 is calibrated against the World Standard Group (WSG), maintained at the WRC Davos every International Pyrheliometer Comparison (IPC). WRR factor of PMO6: 0.998913 (from the last IPC-2021).

This calibration proved that the reference pyranometer has been stable and that the original sensitivity 14.75 µV/(W/m²) ± 0.38 µV/(W/m²) is valid and will be applied (see PMOD calibration details). Observed sensitivity differences between the consecutive years are well within the calibration uncertainty.

PMOD calibration details: The reference pyranometer was compared with the sun and sky radiation as source under mainly clear sky conditions using the "continuous sun-and-shade method". The pyranometer was installed horizontally. During the comparisons, the global radiation ranged from 665 W/m² to 1082 W/m² with a mean of 897 W/m². The solar zenith angle varied from 25.3° to 50.0° with a mean of 33.7°. The ambient temperature ranged from +15.3 °C to +25.3 °C with a mean of +20.6 °C. The sensitivity calculation is based on 225 individual measurements. The readings of the WSG are referred to the World Radiometric Reference (WRR). The estimated uncertainty of the WRR relative to SI is ±0.3%. The obtained sensitivity value and its expanded uncertainty (95% level of confidence) are valid for similar conditions and are:14.75 ± 0.38 µV/W/m². The measurements were performed in Davos (latitude: 46.8143°, longitude: 9.8458°, altitude: 1558 m above sea level). Dates of measurements: 15-19, 25 July 2014. Global radiation data were calculated from the direct solar radiation as measured with the absolute cavity pyrheliometer PMO2 (member of the WSG, WRR- factor: 0.998623 from IPC-2010) and from the diffuse radiation as measured with a continuous disk shaded pyranometer Kipp & Zonen CM22 SN 020059 (ventilated with heated air).

SENSITIVITY	26.24 µV/(W/m²) at normal incidence on horizontal pyranometer
UNCERTAINTY	0.69 µV/(W/m²) = 2.64 %

Justification of total instrument calibration uncertainty

The combined uncertainty of the result of the calibration is the positive "root sum square" of the following components.
1. The expanded uncertainty due to random effects and instrumental errors during the calibration of the reference CMP 3 is ±0.38/14.75 = ±2.58% (k=2). See traceability text.
2. The expanded uncertainty of the transfer procedure (calibration by comparison) is estimated to be ±0.5% (k=2).
3. The estimated uncertainty of the WRR relative to SI: ±0.3% (k=2).
The expanded uncertainty is: $\sqrt{(2.58\%^2 + 0.5\%^2 + 0.3\%^2)} = \pm 2.64\%$ (k=2).

The reported expanded uncertainty is based on the standard uncertainty of the measurement multiplied by a coverage factor k, such that the coverage probability corresponds to approximately 95%. The standard uncertainty has been determined in accordance with EA 04/2.

Notice

The calibration certificate supplied with the instrument is valid at the date of first use. Even though the calibration certificate is dated relative to manufacture, or recalibration, the instrument does not undergo any sensitivity changes when kept in the original packing.

Expected instrument impedance**: 105 Ω ± 7.3 Ω

* Instruments issued before October 2018 are classified conform to ISO 9060:1990.
** This impedance estimate can be helpful to check wire connections for shorts or open connections.

RvA is member of the European Co-operation for Accreditation (EA) and is one of the signatories to the EA Multilateral Agreement (MLA) and to the ILAC Mutual Recognition Arrangement (MRA) for the mutual recognition of calibration certificates.

Reproduction of the complete certificate is allowed. Parts of the certificate may only be produced with written approval of the calibration laboratory.

This certificate is issued provided that the Raad voor Accreditatie does not assume any liability.

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an OTT HydroMet brand

ISO/IEC 17025 CALIBRATION CERTIFICATE

CERTIFICATE NUMBER	031545241608
PYRANOMETER MODEL	CMP 3
SERIAL NUMBER	241608
CALIBRATION DATE	12 August 2024
INSTRUMENT CLASS	ISO 9060, Class C*
CALIBRATION PROCEDURE	ISO 9847:2023 clause 6, type A1
REFERENCE PYRANOMETER	Kipp & Zonen CMP 3 sn 060193 active from 17 January 2024
REFERENCE PYRANOMETER CALIBRATION PROCEDURE	ISO 9846 par5
CALIBRATION LOCATION	Delft Netherlands
CUSTOMER	

REMARKS

Delft, The Netherlands, 12 August 2024

Joop Mes

J. Mes
(in charge of calibration facility)

M. Knoope

M. Knoope
(in charge of test)

Lufft KIPP & ZONEN
Meteorology Division

OTT HydroMet

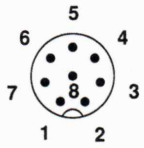
WSxxx Quickstart: Connection & First Check

Thank you for choosing our product. With this quickstart sheet, we would like to assist with connection, installation and first check of the smart weather sensor WSxxx.

Mounting of the WSxxx on a pole:

- For mounting of the sensor on a pole, a **combination wrench SW13** is required
- **WSxxx with wind sensor:** Every device with wind sensor must be **aligned to the North** in order to ensure correct wind measurement, or automatic compass correction must be activated – additional information to compass correction may be found in the WSxxx manual.

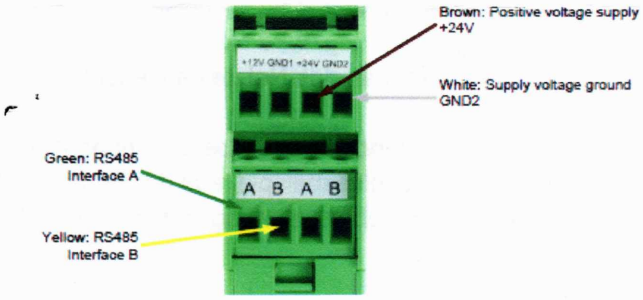
Connections & Pin assignment for using the UMB protocol:



1	White	Supply voltage ground	2	Brown	Positive supply volt. (12-24V)
3	Green	RS485_A (+)	4	Yellow	RS485_B (-)
5	Grey	External Sensor a	6	Pink	External Sensor b
7	Blue	Heating voltage ground	8	Red	Positive heating voltage

Note: If you do not use the UMB protocol, the pin assignment is changing. More detailed information on this subject may be found in the WSxxx manual.

Connection to ISOCON-UMB:



Warning: The heating voltage (red = positive heating voltage; blue = heating voltage ground) is not connected to the ISOCON-UMB but wired direct to the power supply unit.

When using surge protection, please pay attention to the connection example in the surge protection operating instructions.

First check of WSxxx after installation via Config-Tool.NET software:

1. Install Config-Tool.NET on the PC or laptop (Software available on https://www.lufft.com/downloads/)
2. Connect Com-Port PC/laptop with interface ISOCON-UMB (RS232-SUBD9 1:1)
3. Start program under: *Start → programs/Apps → Lufft → start Config-Tool.NET*
4. Create new Workspace *Choose new workspace -> Edit workspace*
5. Choose *Com-port and right serial connection settings*
6. Choose a name for the workspace and use button *"Scan device" and double click on the device WSx-UMB*
7. Update channel list with the *button "load channel list" and activate the desired channels in the menu "device" for the visualization*
8. Go back to the start menu and *activate the measurement with the button RUN/STOP*
9.



Manual of the Lufft smart weather sensor WSxxx:

The complete printed manual is part of the scope of delivery or you will find this as a download too under the following link: www.lufft.com/WSxxx/

Lufft KIPP & ZONEN
Meteorology Division

OTT HydroMet

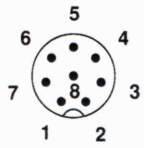
WSxxx Schnellstart: Kabelbelegung & Messdatenkontrolle

Vielen Dank, dass Sie sich für unser Produkt entschieden haben. Mit dieser Quickstart-Anleitung möchten wir Ihnen die ersten Schritte der Inbetriebnahme des Lufft WSxxx Wettersensors erläutern.

Montage der WSxxx:

- Zur Montage des Sensors wird ein **Gabel-Ringschlüssel SW13** benötigt
- **WS mit Windmessung**: Für die korrekte Windmessung muss das Gerät **nach Norden ausgerichtet** sein oder die automatische Kompass-Korrektur aktiviert sein – Nähere Informationen zur automatischen Kompass-Korrektur entnehmen Sie der Bedienanleitung.

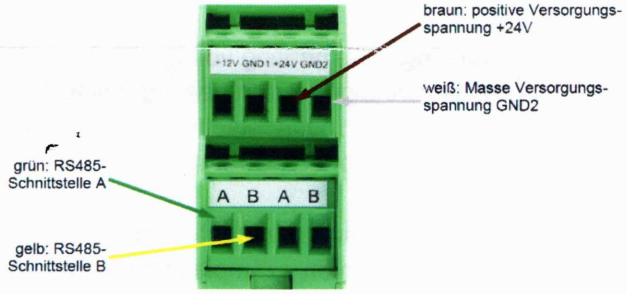
Kabelbelegung / Anschlüsse bei Verwendung des UMB-Protokolls:



1	Weiß	Masse Versorgungsspannung	2	Braun	Pos. Versorgungssp. (12-24V)
3	Grün	RS485_A (+)	4	Gelb	RS485_B (-)
5	Grau	Externer Sensor a	6	Rosa	Externer Sensor b
7	Blau	Masse Heizungsspannung	8	Rot	positive Heizungsspannung

Achtung: Falls zur Messdatenübertragung nicht das UMB-Protokoll verwendet wird, ergeben sich Änderungen in der Klemmbelegung. Hierzu finden Sie ausführliche Informationen in der Bedienanleitung.

Anschluss an ISOCON-UMB:



Achtung: Die Heizungsspannung (rot = positive Heizungsspannung; blau = Masse Heizungsspannung) wird nicht am ISOCON-UMB, sondern direkt an das Netzteil angeschlossen.

Bei der Verwendung des Überspannungsschutz bitte das Anschlussbeispiel aus der Betriebs-anleitung des Überspannungsschutzes beachten!

Messdatenkontrolle nach Installation mit Hilfe der Software Config-Tool.NET:

1. Installieren Sie das Config-Tool.NET auf Ihrem PC / Notebook (Software über die Website https://www.lufft.com/de-de/downloads/ verfügbar)
2. Verbinden Sie den COM-Port PC mit der Schnittstelle ISOCON-UMB (RS232-SUBD9-1:1)
3. Starten Sie das Programm über *Start→Programme/Apps→Lufft→start Config-Tool.NET*
4. Neuen Workspace anlegen über *„neuer Workspace" -> Workspace bearbeiten*
5. Konfigurieren sie nun die richtigen COM-Port Einstellungen
6. Legen sie nun einen Namen für den Workspace an und drücken den Knopf *„Gerätesuche" und klicken sie danach auf das Gerät „WSx-UMB"*
7. Aktualisieren sie nun die Kanalliste mit dem *Knopf „Kanalliste laden" und aktivieren sie die gewünschten Kanäle zur Datenvisualisierung*
8. Gehen sie nun zurück zum Start Menü und *starten die Messung mit dem Knopf RUN/STOP*



Bedienanleitung der intelligenten Wettersensoren WSxxx:
Die gedruckte Bedienanleitung ist Teil des Lieferumfangs oder sie finden diese auch als Download über den folgenden Link: www.lufft.com/WSxxx/