LANSEN

LAN-WMBUS-E2-CO2-(I)

CO2/TEMP/HUMIDITY WITH OPTIONAL INDICATIONS

DEVICE

The combined true CO_2, ambient temperature and humidity device from Lansen is a plug-and-play transmitter. Great care has been taken to design a sleek, good looking device with high security and performance. The device has two antennas for maximum range in both vertical and horizontal directions.

PERFORMANCE

The battery level is continuously monitored and a low level warning is issued when battery is nearing depletion. The CO_2 sensor is also monitored and a warning is issued if it is not working. The device also keeps count on the total running time since first start and powerup.

WARNING / ALARM INDICATION (-I)

The CO_2 devices that ends with -I (stands for indication) comes with visual and acoustic warning/alarm to alert on high CO_2 concentration. The sensor will in this case use a buzzer and high brightness LED to indicate that the CO_2 reached the Warning or Alarm level. This indication can then be used to alert someone that it is time to ventilate the room, e.g., by opening a window.

Since a high concentration of CO_2 correlates to a higher virus spread and causing concentration problems, early warnings and alarms provide both a safer and more efficient workspace.

TEMPERATURE SENSOR

The on-board temperature sensor is highly accurate with typical accuracy $\pm 0.2^0$.

HUMIDITY SENSOR

The on-board humidity sensor is highly accurate in the entire temperature range, with typical accuracy ±2%RH.

CO2 SENSOR

The on-board NDIR CO_2 sensor with diffusion technology is used to measure the absolute CO_2 level. An intelligent calibration routine calibrate the device at startup and then every 20 days during the entire lifetime to ensure good readings. The calibration is done using the lowest reading in the 20 day interval and using this reading as the 400 ppm baseline for the next period. This works on the fact that the CO_2 level move towards 400 ppm (clean air) when the building is not occupied for a period. The first accurate readings can typical be expected after 3-9 days after installation.

MEASUREMENTS

The parameters are sampled every 2 minutes (temperature and humidity) or 4 minutes (CO_2) and sent synchronous using the wireless M-Bus protocol as defined by OMS. This makes the sensor ideal for integration in data collecting systems, drive by solutions or for controlling ventilation. The data from the device is also protected using the AES128 encryption compliant with OMS standard.

FIRMWARE

MODES	C1-A/B, T1 or S1 (selectable on order)
SEND INTERVAL	60s - 1 hour (selectable on order)
SAMPLE INTERVAL	
CO_2	Twice* as long as send interval (default 4 min)
Temperature	Same as send interval (default 2 min)
Humidity	Same as send interval (default 2 min)
ENCRYPTION	AES128 encryption OMS mode 5. Profile A.
STANDARD	T1-mode, transmission 2 minutes, encryption ON, unique key.

WARNINGS

BATTERY	Low battery
SENSOR ERROR	CO_2 sensor not working
CALIBRATION	Calibration not completed yet

LIFESPAN

LAN-WMBUS-E2-CO2	14 years** typical, standard configuration and operating temperature
LAN-WMBUS-E2-CO2-I	10 years** typical, standard configuration and operating temperature

DEVICE

LAN-WMBUS-E2-CO2
LAN-WMBUS-E2-CO2-I

* If send interval is less than two minutes then everything is sampled with the same interval as send interval.

** The expected battery lifetime stated is based on simulations and true measurements at 25 C° and is valid to the best of our ability but not a guarantee. The calculations and measurements can be sent upon request for your reference.

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LANSEN

TECHNICAL DATASHEET LAN-WMBUS-E2 FAMILY

GENERAL INFORMATION

STANDARDS	2014/53/EU (RED), EN 13757-3/4:2013, OMS 4.0.2
MATERIAL	White, ABS

OPERATING CONDITIONS

CO_2 TEMP	0°C to +55°C (-20°C to +55°C on request)
CO_2 PRESSURE	950 mbar to 1050 mbar (other range on request)
RADIO TRANSMITTER	Max: -30°C to +85°C, recommended +5°C to +50°C
RELATIVE HUMIDITY	Non condensing
SIZE (W x H x D)	80 x 80 x 25 mm

POWER

POWER SUPPLY	2 x ER18505 3.6V Li-SOCl2 battery pack.
CAPACITY	7600-8200 mA
VOLTAGE	2.6 to 3.6V
RADIO	14 dBM (25mW) output power to antennas. ERP typical: 9.5 dBm (9 mW)
ANTENNAS	2 antennas for true differential transmission.

DEVICES

Name	Temp	Humidity	CO_2	Pressure	Sound level	Ambient light (LUX)	Optional mains powered 5V	Battery powered	LED and sound indication on CO_2 level
LAN-WMBUS-E-CO2	X	X	X					X	
LAN-WMBUS-E2-CO2-I	X	X	X				X	X	X
LAN-WMBUS-E2-CO2-S	X	X	X		X		X	X	
LAN-WMBUS-E2-CO2-S-I	X	X	X		X		X	X	X
LAN-WMBUS-E2-AEQ (coming product)	X	X	X	X	X	X	X	X	
LAN-WMBUS-E2-AEQ-I (coming product)	X	X	X	X	X	X	X	X	X

SENSORS

Type	Specification	TYP ACC
TEMPERATURE	-40°C to +85°C	±0.2°C at +5°C to +60°C ±0.5°C at -20°C to +85°C
HUMIDITY	0 - 100 %RH	±2 %RH at 20-80 %RH. ±3 %RH at 10-90 %RH ±3.5 %RH at 0-100 %RH
CO_2	0-5000 ppm	±(50 ppm + 3%) after calibration even better on request.
LUX (prel.)	0.01 Lux to 83k Lux at same freq as the human eye.	4%
PRESSURE	20 kPa to 110 kPa absolute pressure	0.4 kPa
SOUND LEVEL (prel.)	40 dBA to 90 dBa at 850 Hz (prel)	TBD

INDICATIONS LED AND SOUND

AIR QUALITY	CO_2 LEVEL (ppm)	LED Color	Led indication on new CO_2 level	Sound indication on new CO_2 level
BAD	> 2000	RED	Bad level reach: Will flash every 2 seconds for 3 minutes, then every minute.	Bad level reached: Will beep total 15 times every 2 seconds.
MEDIOCRE	1000-2000	YELLOW	Mediocre level reached: Will flash every 2 seconds for 3 minutes, then every minute.	Mediocre level reached: Will beep total 15 times every 2 seconds.
OK	< 1000	GREEN	Ok level reached: Will flash every 30 seconds for 10 minutes, then every 2 minutes.	None

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LANSEN
WIRELESS BUILDING TECHNOLOGY

WMBUS DATA FORMAT

TEMP/HUMIDITY/CO2 DEVICE
(LAN-WMBUS-E2-CO2)

TEMP/HUMIDITY/CO2 DEVICE WITH INDICATION
(LAN-WMBUS-E2-CO2-I)

Version: 10.0.0

Verify correct device and version

This document applies to the device LAN-WMBUS-E2-CO2-(I) with protocol version 10. There are two ways of finding out the protocol version of the device; either by looking at the label on the device or by looking at the data packets sent out by the device. See chapters **Protocol version in data packets** and **Protocol version in label** for more information.

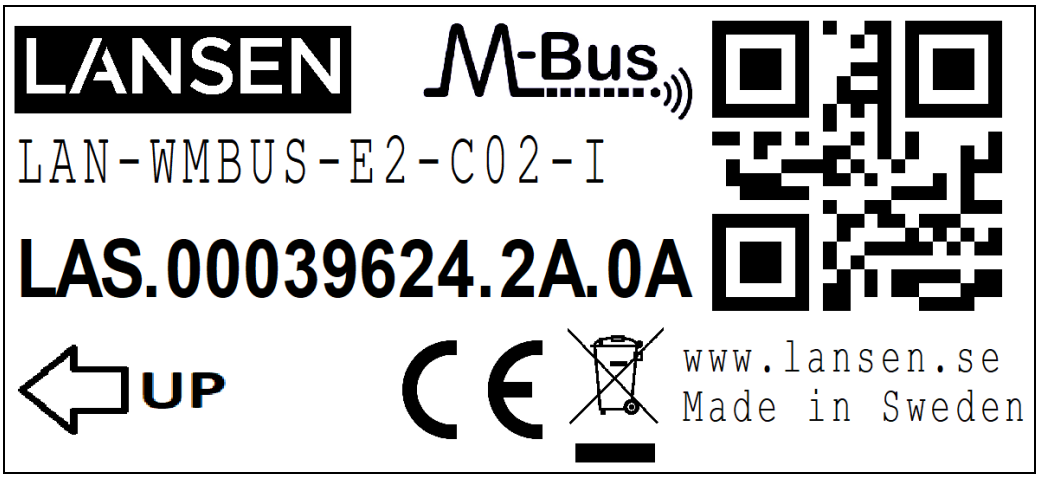
Protocol version in data packets

If it is possible to check the information in the data packets sent out by the device, then the protocol version is included in the data field called *A-Field Protocol version*. For more information, see chapter **WMBUS-data format**.

Protocol version in label

The protocol version can be found on the label. An example of the label is shown in the figure below and the relevant information is described by LAS.00022318.2A.0A, where

- **Manufacturer code**: LAS
- **Serial number**: 00039624
- **Device type**: 2A
- **Protocol version**: 0A



LANSEN
WIRELESS BUILDING TECHNOLOGY

WMBUS-data format

Art nr.	LAN-WMBUS-E2-CO2 / LAN-WMBUS-E2-CO2-I
Version	10 (0x0A)
Information	Packet is sent every 120 seconds in T-mode
DR1	Temperature: Last measured value
DR2	Temperature: Average last hour
DR3	Temperature: Average last 24 hours
DR4	Humidity: Last measured value
DR5	Humidity: Average last hour
DR6	Humidity: Average last 24 hours
DR7	CO2: Last measured value
DR8	CO2: Average last hour
DR9	CO2: Average last 24 hours
DR10	Last used calibration value
DR11	Minutes to next calibration
DR12	On Time in days (Since power up)
DR13	Operating time in days (Total)
DR14	Version
DR15	Status and indications

Byte no	Field Name	Content	Info	Byte data	
1	L-Field	Length			Linklayer
2	C-Field	SND-NR		0x44	
3	M-Field	Meter Manufacturer code	LAS	0x33	
4	M-Field	Meter Manufacturer code		0x30	
5	A-Field	Meter serial number (LSB)	**Example**: 0001067	0x67	
6	A-Field	Meter serial number		0x00	
7	A-Field	Meter serial number		0x01	
8	A-Field	Meter serial number (MSB)		0x00	
9	A-Field	Protocol version		0x0A	
10	A-Field	Meter type	CO2-sensor device	0x2A	
11	CI-Field	Short header		0x7A	Networklayer
12	Access no.	Transmission counter	**Example**: 7	0x07	
13	Status	Device status (error/alarms)	Refer to **Table 1** for possible values	0x00	
14	Configuration	Number of encrypted blocks	**Example**: 3	0x03	
15	Configuration	Encryption		**No encryption**: 0x00 **Encryption mode 5**: 0x05	
16	AES-Verify	Encryption Verification		0x2F	DATA blocks
17	AES-Verify	Encryption Verification		0x2F	
18	DR1	DIF	16-bit integer	0x02	
19	DR1	VIF	External temperature 0.01°C	0x65	
20	DR1	Value (LSB)	**Example**: 0x1122	0x22	
21	DR1	Value (MSB)		0x11	
22	DR2	DIF	16-bit integer + Storage 1	0x42 = Value OK 0x72 = Not enough values	
23	DR2	VIF	External temperature 0.01°C	0x65	
24	DR2	Value (LSB)	**Example**: 0x4365	0x65	
25	DR2	Value (MSB)		0x43	
26	DR3	DIF	16-bit integer	0x82 = Value OK 0xB2 = Not enough values	
27	DR3	DIFE	Storage 2	0x01	
28	DR3	VIF	External temperature 0.01°C	0x65	
29	DR3	Value (LSB)	**Example**: 0x1122	0x22	
30	DR3	Value (MSB)		0x11	
31	DR4	DIF	16-bit integer	0x02	
32	DR4	VIF	Extension table	0xFB	
33	DR4	VIF	Relative humidity 0.1%RH	0x1A	
34	DR4	Value (LSB)	**Example**: 0x1122	0x22	
35	DR4	Value (MSB)		0x11	
36	DR5	DIF	16-bit integer + Storage 1	0x42 = Value OK 0x72 = Not enough values	
37	DR5	VIF	Extension table	0xFB	
38	DR5	VIF	Relative humidity 0.1%RH	0x1A	
39	DR5	Value (LSB)	**Example**: 0x1122	0x22	
40	DR5	Value (MSB)		0x11	
41	DR6	DIF	16-bit integer	0x82 = Value OK	

				0xB2 = Not enough values	
42	DR6	DIFE	Storage 2	0x01	
43	DR6	VIF	Extension table	0xFB	
44	DR6	VIF	Relative humidity 0.1%RH	0x1A	
45	DR6	Value (LSB)	**Example**: 0x1122	0x22	
46	DR6	Value (MSB)		0x11	
47	DR7	DIF	16-bit integer	0x02	
48	DR7	VIF	Extension table	0xFD	
49	DR7	VIF	Dimensionless	0x3A	
50	DR7	Value (LSB)	**Example**: 0x1122	0x22	
51	DR7	Value (MSB)		0x11	
52	DR8	DIF	16-bit integer + Storage 1	0x42 = Value OK 0x72 = Not enough values	
53	DR8	VIF	Extension table	0xFD	
54	DR8	VIF	Dimensionless	0x3A	
55	DR8	Value (LSB)	**Example**: 0x2233	0x33	
56	DR8	Value (MSB)		0x22	
57	DR9	DIF	16-bit integer	0x82 = Value OK 0xB2 = Not enough values	
58	DR9	DIFE	Storage 2	0x01	
59	DR9	VIF	Extension table	0xFD	
60	DR9	VIF	Dimensionless	0x3A	
61	DR9	Value (LSB)	**Example**: 0x0102	0x02	
62	DR9	Value (MSB)		0x01	
63	DR10	DIF	16-bit integer + Extension	0xC2	
64	DR10	DIFE	Storage 3	0x01	
65	DR10	VIF	Extension table	0xFD	
66	DR10	VIF	Dimensionless	0x3A	
67	DR10	Value (LSB)	**Example**: 0x2324	0x24	
68	DR10	Value (MSB)		0x23	
69	DR11	DIF	16-bit integer	0x82	
70	DR11	DIFE	Subunit 1	0x40	
71	DR11	VIF	Extension table	0xFD	
72	DR11	VIF	Dimensionless	0x3A	
73	DR11	Value (LSB)	**Example**: 0x0002	0x02	
74	DR11	Value (MSB)		0x00	
75	DR12	DIF	16-bit integer	0x82	
76	DR12	DIF	16-bit integer	0x02	
77	DR12	VIF	On Time Days	0x23	
78	DR12	Value (LSB)	**Example**: 0x0000	0x00	
79	DR12	Value (MSB)		0x00	
80	DR13	DIF	16-bit integer	0x02	
81	DR13	VIF	Total Operating Time Days	0x27	
82	DR13	Value (LSB)	**Example**: 0x0000	0x00	
83	DR13	Value (MSB)		0x00	
84	DR14	DIF	16-bit integer	0x02	
85	DR14	VIF	Extension table	0xFD	
86	DR14	VIF	Version	0x0F	
87	DR14	Value (LSB)	**Example**: 0x0004	0x04	
88	DR14	Value (MSB)		0x00	
89	DR15	DIF	8-bit integer	0x01	
90	DR15	VIF	Extension table	0xFD	
91	DR15	VIFE	Digital input	0x1B	
92	DR15	Value	Refer to **Table 2** for possible values	0x00	

Table 1: Status byte with errors and alerts

Bit	Info
0 (0x01)	1 = Device is not activated
1 (0x02)	1 = Device is not activated
2 (0x04)	Low battery
3 (0x08)	X
4 (0x10)	CO2: Calibration not yet done
5 (0x20)	X
6 (0x40)	X
7 (0x80)	CO2: External sensor error

Table 2: Indication settings

Bit	Info
0 (0x01)	0 = Device doesn't support any indication 1 = Device supports indication
1 (0x02)	Visual (LED) indication enabled
2 (0x04)	Sound indication enabled
3 (0x08)	CO2: External sensor error or first measurement not yet done
4 (0x10)	CO2: Value was updated with this packet
5 (0x20)	Device is not activated
6 (0x40)	CO2: Calibration not yet done
7 (0x80)	X