

USER'S GUIDE

EE820 – CO₂ Sensor for Demanding Applications

SCOPE OF SUPPLY

- EE820 Sensor according to ordering guide
- Mounting set (screws and rowl plugs / screw anchors)
- Cable gland (only for EE820-HVxxxE1xxx with cable gland)
- Mating M12x1 connector for self assembly (only for EE820-HVxAxE9xxx with M12x1 plug)
- Two self-adhesive labels for configuration changes (see user guide at www.epluse.com/relabeling)
- Quick Guide - For EE820 with M12 plug and EE820 with RS485 output
- Test report according to DIN EN 10204 – 2.2

ACCESSORIES / SPARE PARTS

ACCESSORIES (see datasheet "Accessories"):

USB configuration adapter

HA011066

Product configuration software

EE-PCS (free download: www.epluse.com/EE820)

Mating M12x1 connector for self assembly

HA010707

Connection cable M12x1 socket - flying leads

- 1.5 m (3.3 ft)
- 5 m (16.4 ft)
- 10 m (32.8 ft)

HA010819

HA010820

HA010821

Protective cap for female M12 connectors

HA010781

Protective cap for male M12 connectors

HA010782

Power supply adapter

V03

SPARE PARTS:

Forced air circulation module, without cover

EE820-FAC (HA011302)

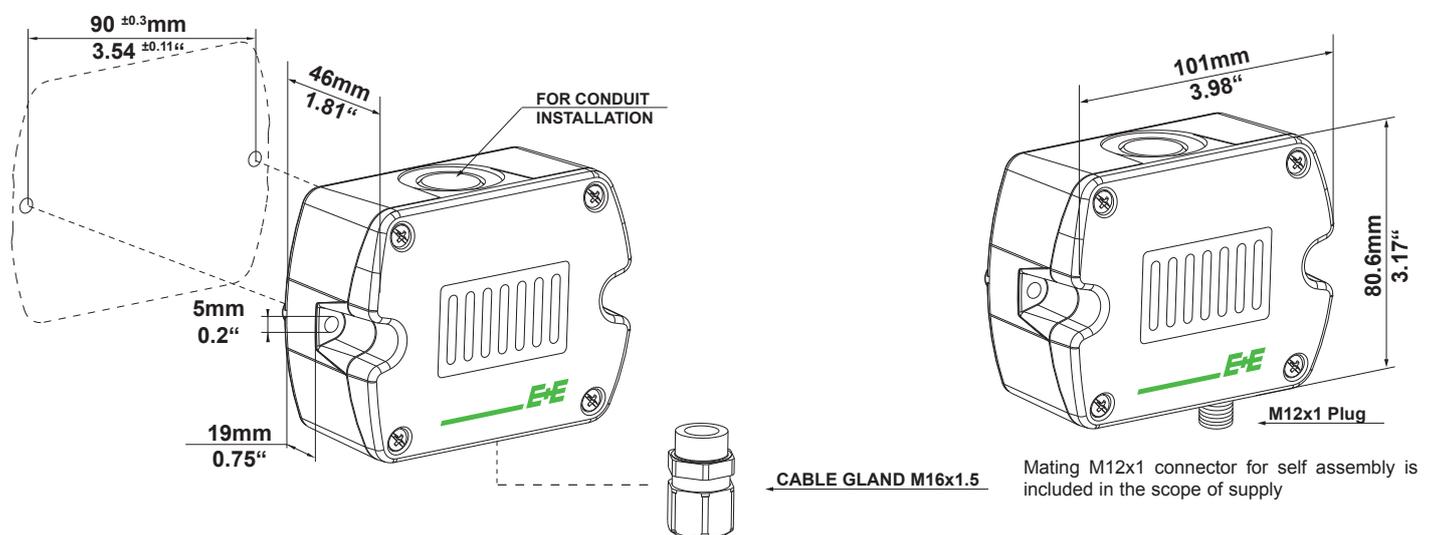
Cover complete with filter and mounting screw

EE820-COVER (HA011303)

CAUTION

- The sensor shall not be exposed to extreme mechanical or thermal stress.
- For use in polluted, dirty environment is essential to close tightly the sensor cover as well as the cable gland or conduit adapter in order to avoid pollution ingress into the enclosure.
- This device is not appropriate for safety, emergency stop or other critical applications where device malfunction or failure could cause injury to human beings.

DIMENSIONS



EE820 with M12 plug does not require any wiring inside the device. The external mounting holes allow the device to be mounted without opening the front cover. The mating M12x1 cable plug for self assembly is included in the scope of supply. Please see EE820 data sheet for optional M12 plugs and cables.

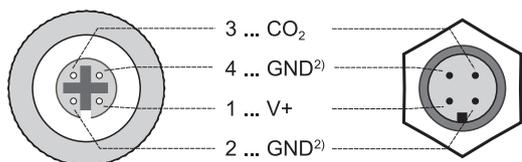
EE820 with cable gland: Use a matching wrench to install the cable gland (in the scope of supply) onto the EE820 enclosure.

EE820 with conduit connection for the North American market: use a flat screwdriver to knock open the blind, carefully, in order to avoid damaging the electronics inside the enclosure. The conduit adapter is not included in the scope of supply. The M16x1.5 opening for the cable gland shall be tightly closed using the blind plug included in the scope of supply.

CONNECTION DIAGRAM

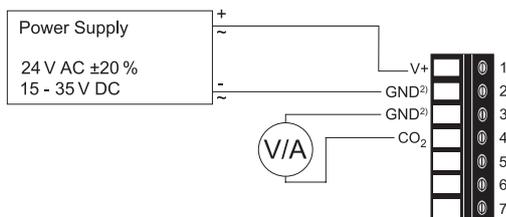
EE820 WITH ANALOGUE OUTPUT

EE820 WITH M12 PLUG¹⁾

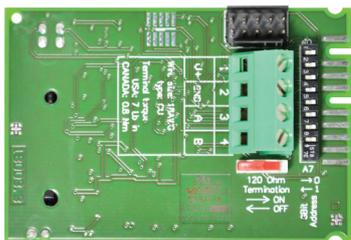


- 1) Mating M12x1 connector for self assembly is included in the scope of supply
- 2) **Very important:** for failure-free operation and performance according to the specs the supply GND and the measurement GND must be wired separately.

EE820 WITH CABLE GLAND

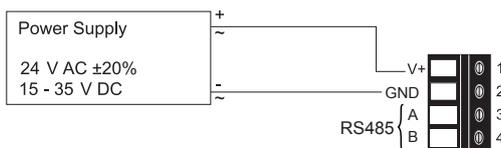


EE820 WITH RS485 INTERFACE



EE820-HVxJ3

EE820-HVxJ3



TECHNICAL DATA

(Modification rights reserved)

Measured values

Measuring principle	dual wavelength non-dispersive infrared technology (NDIR)		
Measurement range	0...2.000 / 5.000 / 10.000 ppm		
Accuracy at 25 °C (77 °F) and 1013 mbar (14.7 psi)	0...2.000 ppm:	< ± (50 ppm + 2 % of mv)	mv = measured value
	0...5.000 ppm:	< ± (50 ppm + 3 % of mv)	
	0...10.000 ppm:	< ± (100 ppm + 5 % of mv)	
Response time t_{63} , typ.	300 s (standard) 140 s (fast, with forced air circulation module)		
Temperature dependency	typ. ± (1 + CO ₂ concentration [ppm] / 1.000) ppm/°C (-20...45 °C) (-4...113 °F)		
Sample rate	approx. 15 s		

Output

Analogue

0...2.000 / 5.000 / 10.000 ppm	0-5 / 0-10 V	-1mA < I _L < 1 mA	
	4-20 mA	R _L < 500 Ohm	R _L = load resistance

Digital Interface	RS485 with max. 32 unit load devices on one bus		
Protocol	Modbus RTU or BACnet MS/TP		
General			
Supply voltage	24 V AC ±20%	15 - 35 V DC	
Current consumption, typ.	15 mA + output current, for standard response time		
	60 mA + output current, for fast response time		
Current peak, max.	350 mA for 0.3 s (analogue output)		
	150 mA for 0.3 s (RS-485 interface)		
Warm up time ¹⁾	< 5 min		
Enclosure material	Polycarbonate, UL94V-0 approved		
Protection class	IP54		
Electrical connection	Screw terminals 2.5 mm ² or M12 plug		
Electromagnetic compatibility	EN61326-1	EN61326-2-3	Industrial Environment
	FCC Part 15	ICES-003 ClassB	
Working conditions	-20...60 °C (-4...140 °F)		0...100 % RH (non-condensing)
Storage conditions	-20...60 °C (-4...140 °F)		0...95 % RH (non-condensing)



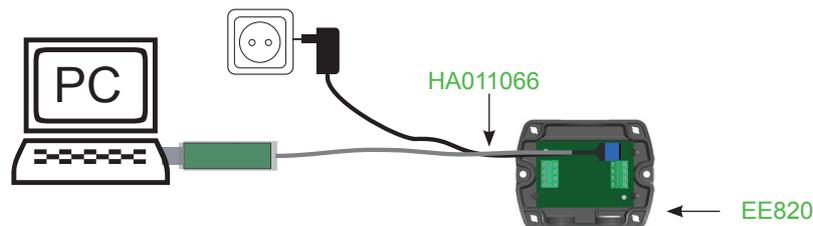
1) for performance according to specification

SETUP AND ADJUSTMENT

The EE820 is ready to use and does not require any configuration by the user. The factory setup of EE820 corresponds to the type number ordered. For ordering guide please see data sheet at www.epluse.com/EE820.

If needed, the user can change the factory setup by using the optional USB Configuration Adapter (HA011066) and the Product Configuration Software EE-PCS (available for free download at www.epluse.com/configurator). One can change CO₂ output signal, scaling of the outputs, digital settings and perform CO₂ adjustment/calibration.

Note: The EE820 must not be connected to any additional power supply when using the USB Configuration Adapter (HA011066).

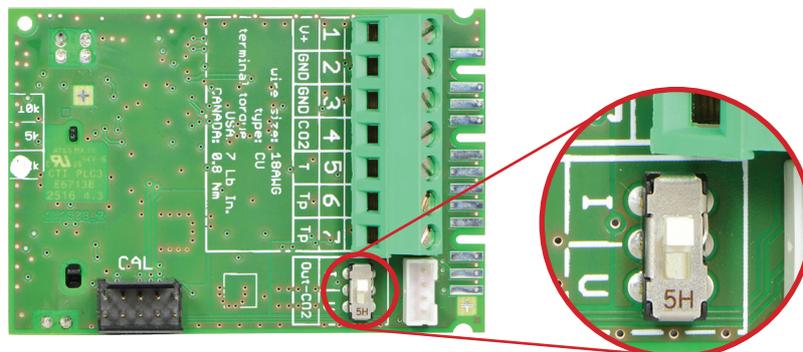


ANALOGUE VERSION

CHANGING THE OUTPUT SIGNAL:

The output signal can be changed from voltage to current or vice-versa.

Set the output signal selection switch to I for current 4 - 20 mA output or to U for voltage 0 - 10 V output. The original CO₂ output range does not change and the calibration data remains valid.



Example:

Factory setup: voltage output (U), output scale: 0 - 10 V = 0 - 5000 ppm

User setup (after setting the output signal selection switch to I): current output (I), output scale: 4 - 20 mA = 0 - 5000 ppm.

CHANGING THE OUTPUT SCALE:

The scaling of the output can be changed by using the USB Configuration Adapter (HA011066) and EE-PCS.

Example:

The initial scaling of the output is 4 - 20 mA = 0 - 5000 ppm.

The output scale after the change can be 4 - 20 mA = 400 - 4000 ppm.

Important:

- After changing the factory setup (output signal and/or output scale) the original type number on the EE820 identification label loses its validity; it does not match any longer the device setup.
- The return to factory setup function of EE-PCS restores the original adjustment/calibration of the device, but does not affect the user setup for output signal and output scale.

DIGITAL VERSION

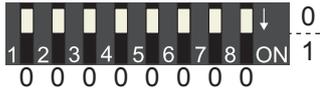
HARDWARE

The bus termination shall be realized with 120 Ohm resistor (slide switch on the board).

Very important:

For proper function the power supply must be strong enough to ensure supply voltage within the specified range (see technical data) at any time and at all devices in the bus. This is particularly relevant when using long and thin cables which can cause high voltage drop. Please note that a single EE820 requires peak current of 150 mA.

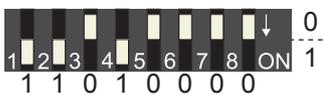
ADDRESS SWITCH



Address setting via EE-PCS Product Configuration Software:

All Dip-Switches at position 0 → address has to be set via Product Configuration Software
Modbus (Slave device): factory setting EE820: 67 (permitted values: 1...247).
BACnet (Master device): factory setting EE820: 67 (permitted values: 0...127).
Example: Slave address is set via configuration software.

ADDRESS SWITCH



Address setting via Dip-Switch:

Modbus (Slave device): Setting the Dip-Switch to any other address than 0, overrules the slave address set via configuration software (permitted values: 1...247).
BACnet (Master device): Setting the Dip-Switch to any other address than 0, overrules the slave address set via configuration software.
BACnet Note: permitted values are 0...127. The 8th bit of the Dip-Switch is ignored (ID 127 = 0111 111).
 To set address 0 via Dip-Switch, the 8th bit shall be set to 1 (ID 0 = 1000 0000).
Example: Slave address set to 11 (= 0000 1011 binary).

BACNET SETUP

Please see PICS (Product Implementation Conformance Statement) - available on www.epluse.com/EE820.

MODBUS SETUP

The measured values are saved as a 32 bit float value and 16 bit signed integer.

The EE820 factory setting for the slave-ID (Modbus address) is 67 as an integer 16 bit value. This ID can be changed by the user in the register 60001 (0x00), permitted values are 1...247.

The serial number as ASCII-code is located at read register address 30001-30008 (16 bit per address).

The firmware version is located at register address 30009 (bit 15...8 = major release; bit 7...0 = minor release).

FLOAT (read register):

Function code / Register number ¹⁾ [Dec]	Register address ²⁾ [HEX]	Parameter name	
31061	0x424	CO ₂ average	[ppm]
31063	0x426	CO ₂ RAW	[ppm]

1) Register number starts from 1

2) Register address starts from 0

INTEGER (read register):

Function code / Register number ¹⁾ [Dec]	Register address ²⁾ [HEX]	Parameter name	
34031	0xFBE	CO ₂ average	[ppm] * 1
34032	0xFBF	CO ₂ RAW	[ppm] * 1

*1 is the scale 1:1 (e.g.: 800 is equivalent to 800 ppm)

INTEGER (write register):

Function code / Register number ¹⁾ [Dec]	Register address ²⁾ [HEX]	Parameter name
60001	0x00	Slave-ID (modbus address)*
60002	0x01	Modbus protocol settings**

* If the ID is set via DIP-Switch the response will be NAK.

** For Modbus protocol setting please see Application Note Modbus AN0103 at www.epluse.com

INFO (read register):

Function code / Register number ¹⁾ [Dec]	Register address ²⁾ [HEX]	Parameter name
30001	0x00	Serial number (as ASCII)
30009	0x08	Firmware version

MODBUS RTU EXAMPLE

Example of MODBUS RTU command for reading the CO₂ (float value) CO₂ = 1288,34375 ppm from the register 0x424

Device EE820; slave ID 67 [43 in HEX]

Reference document, chapter 6.3: http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b.pdf

Request [Hex]: 43 03 04 24 00 02 8A 12

	Modbus ID address	Function code	Starting address Hi	Starting address Lo	No. of register Hi	No. of register Lo	CRC	
Request [Hex]:	43	03	04	24	00	02	8A	12

Response [Hex]: 43 03 04 0B 00 44 A1 68 AB

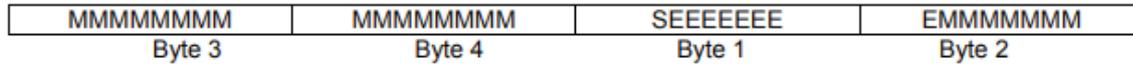
	Modbus ID address	Function code	Byte count	Register 1 value Hi	Register 1 value Lo	Register 2 value Hi	Register 2 value Lo	CRC	
Response [Hex]:	43	03	04	0B	00	44	A1	68	AB

Modbus floating point format

For decoding of float values (stored according standard IEEE754), please refer to AN0103, chapter 7

7.2 Modbus floating point format

E+E devices use the Modbus floating point format. The byte pairs 1, 2 and 3, 4 are inverted as follows.



Example:

Response [Hex]	Value in decimal
44 A1 0B 00	1288.34375

Protocol setting:

Address, baudrate, parity and stop bits can be set via:

1. Product Configurator Software (available on www.epluse.com/ee820)
2. Modbus protocol (please see Application Note Modbus (available on www.epluse.com/ee820))

MAINTENANCE

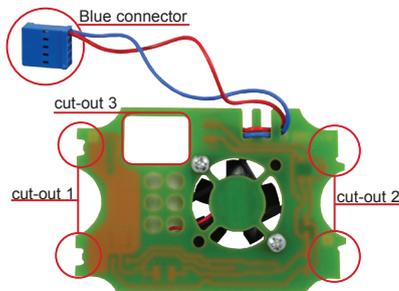
Even in case of use in dirty and dusty environment, the electronics of EE820 are very well protected by the enclosure and the filter on the front cover. Do not attempt in any way to clean the inside of the device.

In case of dirt deposits on the exterior of the device, this can be cleaned by weeping it gently with a soft, light wet cloth. The enclosure must be closed during the cleaning. Do not use solvent-based cleaning agents; these might affect the enclosure and the labels. Do not attempt to clean the filter on the front cover, as it would only lead to its faster clogging.

In a polluted environment, the filter on the front cover of EE820 might get clogged in a long run. This is more likely to happen for the EE820 with forced air circulation. Longer response time indicates a clogged filter. In such a case the entire front cover shall be replaced by an original new one (see spare parts and instruction below).

Protection filters caps for M12 connector are available to preserve the contacts of plug / socket in case of temporary removing of sensor (see accessories).

REPLACEMENT / RETROFIT FORCED AIR CIRCULATION MODULE



EE820-FAC



EE820-COVER

Caution:

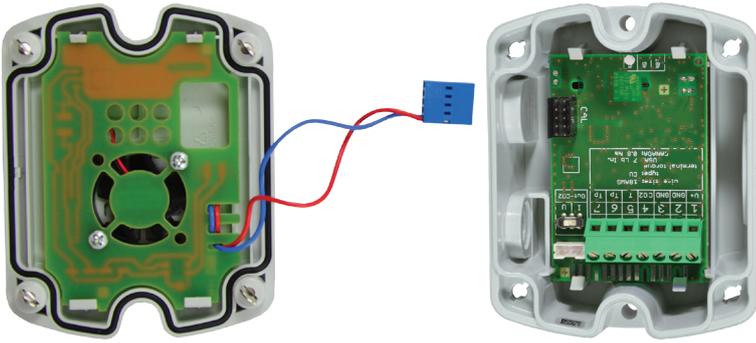
The EE820-FAC Forced Air Circulation Module is an ESD sensitive device and shall be handled at all times according to the general precautions for handling of ESD sensitive equipment.

REPLACING

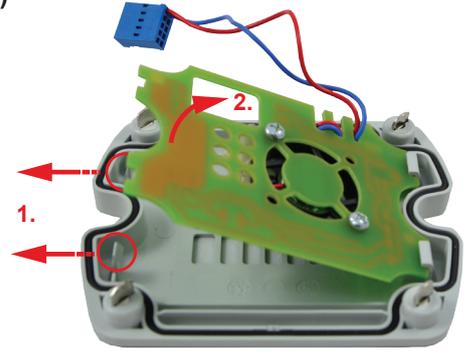
For replacing an existing EE820-FAC module remove first the old EE820-FAC module:

- Disconnect the blue connector from the main EE820 board.

1)



2)

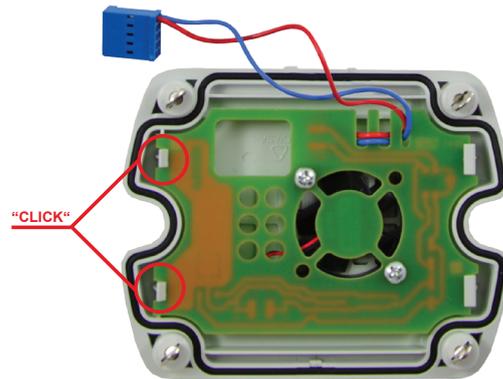
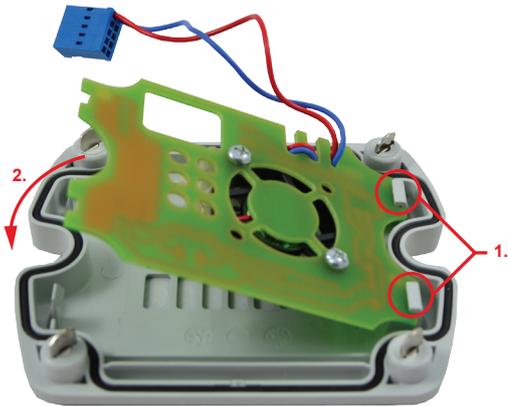


INSTALLING

- Release the old EE820-FAC by acting on restraint A.

For installing the new EE820-FAC:

- Observe the position of the A and B restraints in the cover and of the corresponding cut-outs 1 and 2 in the EE820-FAC board.
- Insert first the EE820-FAC into the B restraints. Then press the EE820-FAC as in the picture below, till it snaps into the A restraints.



- Connect the blue connector of the EE820-FAC to the blue socket on the main EE820 board.
- Place the cover on the EE820 so that the cut-out 3 matches the location of the blue connector.



- Fix the cover with the 4 bayonett screws D.



**USA
FCC notice:**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the installation manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**CANADIAN
ICES-003 Issue 5:
CAN ICES-3 B / NMB-3 B**

INFORMATION

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