Combustible gases

E2618-LEL transmitter is sensitive to light hydrocarbon gases (acetylene, methane, propane, butane) and hydrogen.

See Annex 2 for more detailed information concerning the prorerties of the detected gases.

NOTE Transmitter with catalytic type sensor is nit available for acetylene detection.

Installation guidelines

(See **Installation and connections** section for general information.)

For gases lighter than air install the sensor higher than potential leakage/generation source or near the ceiling. Combustible gases lighter than air are hydrogen (0,07 of air density), methane (0,55 of air density) and acetylene (0.90 of air density).

Propane and butane are heavier than air (1.55 and 2.0 of air density respectively) and tend to sink. It is recommended to place the sensor lower than potential leakage or generation sourse.

Calibration

E2618-LEL transmitters have been calibrated by Manufacturer with standard gas mixtures before delivery. Provided that the sensor is used under moderate conditions, field recalibration is recommended once a year. Catalytic sensors are more sensitive to the environment and require field recalibration every 3...6 months. Please contact your dealer for more information.

Maintenance

Do not perform any maintenance operation with the power on.

Clean the device with soft damp cloth. Do not use any abrasive cleaning agents. Do not immerse the device into water or any cleaning media.

Warranty

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of original sale. During this warranty period Manufacturer will, at its option, either repair or replace product that proves to be defective. This warranty is void if the product has been operated in conditions outside ranges specified by Manufacturer or damaged by customer error or negligence or if there has been an unauthorised modification.

Delivery set

– Transmitter E2618 (wall mount or duct mount version)
– Mounting accessories:
- 4 screws with plastic dowels for wall mount version
- rubber flange for duct mount version.
- fixing clamp for remote probe version

Specifications

Detected gases	Acetylene, Butane, Hydrogen, Methane, Propane	
Sampling method	diffusion	
Sensor type	metal oxide semiconductor	catalytic (pellistor)
Typical detection range	0...100% LEL	0...100% LEL
Resolution / digital unit	0.1% LEL	1% LEL
Response time T90	ca. 60 s	8 s
Sensor lifetime	> 5 years	> 2 years
Calibration interval	12 months	3...6 months
	-30...+70 °C	-20 to +60°C
Operating conditions	<95 %RH, atmospheric pressure ±10%; explosion safe (non ATEX rated) spaces Normal ambient oxygen level Avoid strong mechanical shock, vibrations or EMI Avoid exposure to corrosive gases or silicon containing products	
Signal update	every 1 second	
Load resistance	R_L < (Us - 2 V) / 22 mA for 4-20 mA R_L > 250 kOhm for 0-10 V mode	
Digital interface	RS485, Modbus RTU protocol no galvanic isolation	
Power supply options	11...30 VDC, 24 VAC	
Power consumption	< 2 VA	
Analog outputs	2 × 4-20 mA / 0-10 V, user settable	
Outputs assignment	OUT1 2 gas; OUT2 2 gas **NOTE** For LCD version only OUT1 is available.	
Enclosure	grey ABS, wall or duct mount, protection class IP65	
Dimensions	H82 × W80 × D55 mm	
CE marking	according to 2014/30/EU and EN61326-1 requirements	
LCD option		
Operating temperature	0...+50 °C	
Display dimensions	72 × 36 mm	
Number of digits	3.5 7-segment	
Character height	14 mm	
Other features	Backlight	
Other options		
Remote probe	Protection IP65, default cable length 3.0 m; max height 80 mm, max diameter 65 mm	

Combustible Gases Transmitter
E2618-LEL

User Manual

CE

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E2618-series transmitters belong to the PluraSens® family of multifunctional measurement instruments. The instruments utilise gas sensors of various types with excellent repeatability, stability and long lifetime

The devices are supplied either in duct-mount or wall-mount version. The wall mount version of the device is available with remote probe. The remote probe is connected to the main unit with shielded cable. Default connection cable length is 3 m.

E2618 series provides two independent analog outputs OUT1 and OUT2, user-selectable to 4-20 mA or 0-10 V, proportional either to gas concentration or temperature. RS485 Modbus RTU digital communication interface allows easy instrument configuration and integration into various automation systems.

A design with LCD indicator is available as an option.

The version of your transmitter is marked on the package.

Safety requirements

Always adhere to the safety provisions applicable in the country of use.

Do not perform any maintenance operation with the power on. Do not let water or foreign objects inside the device.

Operating conditions

The device should be used in explosion-safe (non ATEX -rated) indoor areas, without aggressive gases in the atmosphere. See **Specification** table for more details.

Installation and connections

There are no precise rules or standards to follow when installing the gas detectors. The following points must be taken into account:
- application (air quality control or leakage detection),
- properties of the space under investigation (room geometry, direction and velocity of air flows etc),
- detected gas (relative density to air, whether the gas is flammable, or toxic, or oxygen displacing),
- safety: strong vibrations, mechanical shock, and the sources of strong electromagnetic interference should be avoided,
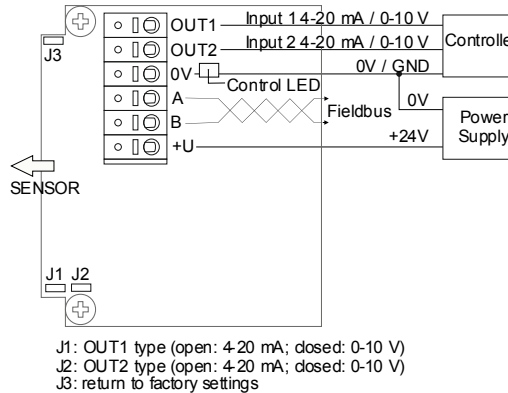- the device should be accessible for maintenance and repair.

For early leakage detection install the sensor as close as possible to the potential leakage sources (flanges, valves, pressure reducers, pumps, etc), taking into consideration other points listed above. For general area monitoring without definite leakage sources, the detectors should be distributed evenly in the room. For personal safety control the detectors are installed in the breathing zone (at the height of the head of people or animals). Recommended sensor position is vertical, pointing downwards. See **Installation guidelines** section on the next page for more information.

1. <u>Wall mount version:</u> Unscrew four lid screws and detach the lid from the transmitter. Attach the device to a wall with screws passing through mounting holes (see dimensional drawing below).
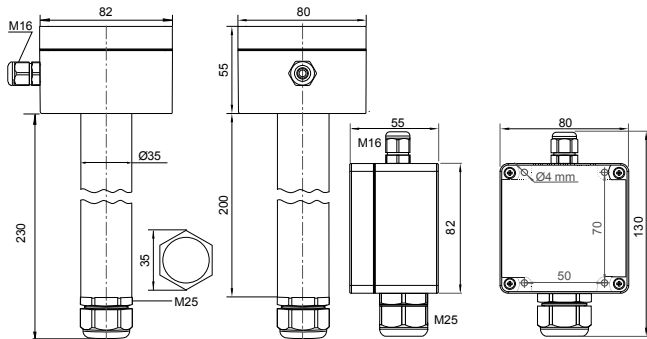
<u>Duct mount version:</u> Cut hole with a diameter of 36...45 mm in the air duct at the chosen mounting place. Place the rubber flange aligning the holes in the flange and the air-duct and fix the flange with four self-tapping screws. Pass the sensor probe through the flange and adjust it to the appropriate depth. Unscrew four lid screws and detach the lid from the transmitter.

2. Use two M16 cable glands to pass the cables of the power supply and of the external devices. Attach the power cable to the device without turning it on. Using the connection diagram below, connect the analog outputs and digital interface terminals to the relevant devices according to your tasks.

J1: OUT1 type (open: 4-20 mA; closed: 0-10 V)
J2: OUT2 type (open: 4-20 mA; closed: 0-10 V)
J3: return to factory settings

The screwless quick connect spring terminals on the E2618 series devices are suitable for a wide range of wires with cross-section 0,2...1,5 mm². We recommend to strip the wire end by 8...9 mm and tin it, or to use the wire end sleeves.

To connect the wire, insert the wire end into terminal hole. To disconnect, push the spring loaded terminal lever, pull the wire out, and release the lever.

Use twisted pair cable, e.g. LiYY TP 2×2×0,5 mm² or CAT 5, to connect the device to RS485 network. Use one pair for A and B wires and the second pair for common 0 V and power +U wires to connect the transmitter to Fieldbus network. Respect polarity. Overall length of all connections via RS485 interface should not exceed 1200 m. The type of each analog output can be independently changed between 4-20 mA and 0-10 V with jumpers J1 (OUT1) and J2 (OUT2).

With closed jumper the output is 0-10 V, with open jumper the output is 4-20 mA.

By default both outputs OUT1 and OUT2 are assigned to gas concentration. The device has built-in temperature sensor which may be tied to any of the outputs. The output assignments and scales can be changed by Modbus commands.

We recommend to set the difference between the upper and bottom limits of the output scale not narrower than 20% of detection range (for CO detectors the scales down to 5% of range are allowed). In any case, do not set the output scale below the tenfold resolution of the device.

🛈 **NOTE** If you use a version with LCD, only OUT1 is available.

3. Turn on the power. The sensor heating up may take up to five minutes after switching on. During this period relays, analog outputs and Modbus interface are off. A LED placed on the PCB of the device allows to control the connection process. The LED response to different processes is presented in the table below.

Process	LED mode
Sensor heating period	Blinking 0.5 Hz (50% on, 50% off)
Sensor absence or malfunction	Blinking 0.5 Hz (90% off, 10% on)
Modbus response	The signal is modulated with short on-off pulses, even single Modbus cycle is traceable*
Normal measurement	Continuous light

4. Make sure that the transmitter is properly mounted, the external devices connected, power on and control LED is constantly lit. Place the lid back and fix it with the screws. The device is ready to use.

It is recommended to keep the device on constantly, except for periods of maintenance and calibration, deplacement etc.

Sensor probe handling

The wall mount version of the transmitter is available with remote probe (see drawing below for dimensions). The remote probe is connected to the main unit with shielded cable. Default connection cable length is 3 m.The sensor probes of all types are equipped with a hydrophobic microporous PTFE filter to protect the sensor from dust, dirt and water drops. The filter may be replaced if it gets strongly contaminated. To replace the PTFE filter, unscrew the M25 nut and remove the old filter. Place a new filter into the nut and tighten it again.
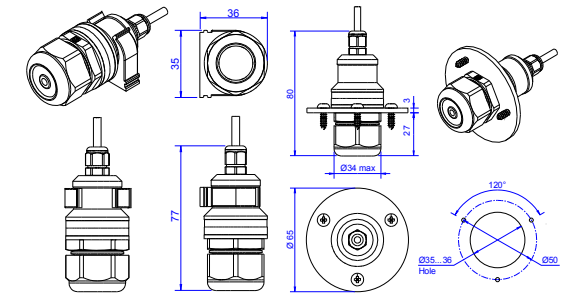
NB! Never stab or press the filter near its centre where the sensor is located since this may damage the sensor.

The recommended orientation of sensor probe is vertical with the sensor tip pointing downwards. This prevents possible accumulation of condensed water on the sensor protection filter. The horizontal orientation is also suitable. Avoid upward position of the sensor tip.

Configuring

Gas transmitters E2618 share all functionalities of the PluraSens® multifunctional transmitter platform. The features and options include:

- digital output change rate limiting filter
- digital integrating (averaging) filter
- temperature measurement channel with internal sensor
- free assignment of each analog output to chosen parameter
- flexible setting of analog output scales for each output
- output shift and slope adjustment for calibration
- Modbus controlled forced state option for analog outputs .

E2618 can be configured through its RS485 interface by Modbus RTU commands. A standard configuration kit includes Model E1087 USB-EIA485 converter and a software pack. Please contact your Seller or the Manufacturer for more information.

Return to default settings

To reset the device's Slave ID, baudrate and sbit number to factory settings, proceed as follows:
1. De-energize the device
2. Connect the J3 jumper
3. Turn on the device
4. De-energize the device
5. Disconnect the J3 jumper
6. Turn on the device

RS485 communication interface

See Annex 1

E2618_UM_EN Annex 1. Modbus RTU Communication Reference

RS485 communication interface

Databits: 8 Parity: none Stop bits: 1 or 2 Protocol: Modbus RTU	Supported Modbus functions: 03 - read multiple registers 06 - write single register

Communication parameters

Parameter	Permitted values	Default
Supported baudrates	1200, 2400, 4800, 9600, 19200, 38400, 57600	9600
Data bits	8	8
Parity	none	none
Stop bits	1, 2	1
Protocol	Modbus RTU	
Modbus functions	03 - read multiple registers 06 - write single register	
Error codes	01 - illegal function 02 - illegal data address 03 - illegal data value 04 - slave device failure (details of last error 04 can be read from register 0x0008)	

Modbus holding registers

Register addresses are shown 0-based, Addr in hexadecimal, Reg in decimal format.
Modbus holding register numbers MHR are shown in decimal 1-based format, and may be addressed either from 00001 or 40001 base.

Addr	Reg / MHR	RW	Description	Supported values (dec)	Default
0x0001	1	R	Hardware version		-
0x0002	2	R	Software version		-
0x0003	3	R	Product serial number	1...65535	-
0x0004	4	RW	Slave ID (net address) *	1...247 **	1
0x0005	5	RW	Baudrate *	1200, 2400, 4800, 9600, 19200, 38400, 57600	9600
0x0006	6 /40007	RW	Response delay, ms	1...255	10
0x0007	7 / 40008	RW	Stop bits *	1: no parity bit, 1 stop bit (default after factory reset) 2: no parity bit, 2 stop bits 3: odd parity, 1 stop bit 4: even parity, 1 stop bit **NOTE**: 3 and 4 are available starting from the Sofrware version 0x218 (dec. 536)	1
0x0008	8 /40009	R	Last error code	1...255	-
0x0011	17 / 40018	RW	Restarts counter	write '42330' to restart device (no response will follow)	-
0x0097	151 /40152	R	Sensor type code	0...65535	0
0x0098	152 /40153	R	Output units code	0 - ppm, 1 - ‰, 2 - %	0

* - The new value is applied after restart.

** - Broadcast slave ID 0 can be used to assign a new ID to device with unknown ID. When addressing by ID 0 the device shall be the only Modbus instrument in the network. The device will not respond to Master command when addressed by ID 0.

*** - This value is dynamic and not kept in EEPROM after restart

E2618_UM_EN Annex 1. E2618 series Modbus holding registers (part 2)

Register addresses are shown 0-based, Addr in hexadecimal, Reg in decimal format.
Modbus holding register numbers MHR are shown in decimal 1-based format, and may be addressed either from 00001 or 40001 base.

Addr	Reg / MHR	RW	Description	Supported values (dec)	Default
0x00A2	162 / 40163	RW	Zero adjustment for temperature data, °C × 100	-32000...+32000 (-320,00...+320,00 °C)	0
0x00A5	165 / 40166	RW	Zero adjustment for gas data, ADC	-32000...+32000 ADC units	0
0x00A6	166 / 40167	RW	Slope adjustment for gas data	1...65535	512
0x00A7	167 / 40168	RW	Change rate limit for gas data, ppm (‰ for O_2) / s	1...32000, 0 - no limit	0
0x00A8	168 / 40169	RW	Integrating filter time constant, s	1...32000 (seconds), 0 - no filter	0
0x00C9	201 / 40202	RW	Parameter tied to analog output 1	0-none 1- temperature 2- gas concentration 9- forced Modbus control, value set in MHR / 40204	2
0x00CA	202 / 40203	RW	Parameter tied to analog output 2	0-none 1- temperature 2- gas concentration 9- forced Modbus control, value set in MHR / 40205	2
0x00CB	203 / 40204	RW	Forced value for analog output 1***	0...1000 (0,0%...100,0% of output scale)	0
0x00CC	204 / 40205	RW	Forced value for analog output 2***	0...1000 (0,0%...100,0% of output scale)	0
0x00FF	255 / 40256	RW	Sensor, analog outputs, LED and buzzer status	bit[0]=0/1 - sensor present/absent, read-only! bit[1]=0/1 - analog outputs deactivated/activated, bit[2]= 0/1 - in case the sensor is absent, turn signaling off/on analog output1, bit[3]=0/1 - in case the sensor is absent, turn on signaling with low current/high current on analog output1; if bit[2]==0 this bit will be ignored, bit[4]=0/1 - in case of sensor absent, turn signaling off/on analog output2 bit[5]=0/1 - in case of sensor absent, turn on signaling with low current/high current on analog output2; if bit[4]==0 this bit will be ignored, bit[6]=0/1 - current/voltage output detected on output1, read-only! bit[7]=0/1 - current/voltage output detected on output2, read-only! bit[8]=0/1 - LED deactivated/activated (always 0 for E2618), bit[9]=0/1 - buzzer deactivated/activated (always 0 for E2618)	-
0x0100	256 / 40257	R	Raw temperature data, °C×100	signed integer, -4000...+8500 (-40,00...+85,00 °C)	
0x0101	257 / 40258	R	Raw gas sensor data	ADC data 0...4095	
0x0102	258 / 40259	R	Measured temperature, °C×100	signed integer, -4000...+12500 (-40,00...+125,00 °C)	
0x0103	259 / 40260	R	Gas concentration, ppm / ‰	signed integer, -32000...+32000 (ppm / ‰)	
0x0105	261 / 40262	RW	0% value for analog output 1	signed integer, -32000...+32000 (ppm / ‰)	0
0x0106	262 / 40263	RW	100% value for analog output 1	signed integer, -32000...+32000 (ppm / ‰)	1000
0x0107	263 / 40264	RW	0% value for analog output 2	signed integer, -32000...+32000 (ppm / ‰)	0
0x0108	264 / 40265	RW	100% value for analog output 2	signed integer, -32000...+32000 (ppm / ‰)	1000

* - The new value is applied after restart.

** - Broadcast slave ID 0 can be used to assign a new ID to device with unknown ID. When addressing by ID 0 the device shall be the only Modbus instrument in the network. The device will not respond to Master command when addressed by ID 0.

*** - This value is dynamic and not kept in EEPROM after restart

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Combustible Gases Transmitter E2618-LEL
User Manual Annex 2 Properties of selected gases

Acetylene

Synonyms/Trade Names: Ethine, Ethyne

Colorless flammable gas lighter that air. Mixtures with air are explosive.

Results from the interaction of calcium carbide with water. In industrial production, acetylene is mainly manufactured by the pyrolisis of light hydrocarbons.

Acetylene is widely used for welding and cutting of metals. The usage of acetylene as a feedstock in chemical industry declines due to cost and environmental considerations.

Chemical formula	$HC \equiv CH$
Molar weight	26
Relative gas density (to air)	0.90
Conversion	1 ppm = 1.06 mg/m^3
Boiling point	-84 °C
Low explosive limit (LEL), % vol in air	2.3* (2.5**)
Upper explosive limit (UEL), % vol in air	100
Odour	Odourless or with a faint ethereal smell if pure. Commercial grade may have garlic-like smell due to impurities.
Hazards	Highly flammable. Gas/air mixtures are explosive. Forms explosive acetylide compounds with copper, mercury, silver & brasses (containing more than 66% copper). Asphyxiant. Non-toxic, but, when generated from calcium carbide, it can contain toxic impurities such as traces of phosphine and arsine.
Exposure limits (NIOSH)	REL C	2662 mg/m^3 /2500 ppm

Butane

Butane is colorless flammable gas heavier than air. The term "butane" is used for any one of two structural isomers (*n*-butane or isobutane, with unbranched and branched chain respectively) or for their mixture.
Occurs in light petroleum fractions.
Butane is used mainly as a fuel and as a feedstock in organic synthesis. It is applied also as a propellant in aerosol sprays and may be used as ozone-friendly refrigerant.
Mixtures of butane with propane and other hydrocarbons are referred to as LPG (liquefied petroleum gas).

Chemical formula	n-butane $CH_3CH_2CH_2CH_3$	iso-butane $CH_3CH(CH_3)CH_3$
Molar weight	58	
Relative gas density (to air)	2.0	
Conversion	1 ppm = 2.38 mg/m^3	
Boiling point	-0.56 °C	−11.7 °C
Low explosive limit (LEL), % vol in air	1.4* (1.6**)	1.5* (1.8**)
Upper explosive limit (UEL), % vol in air	8.4	9.6
Odour	gasoline-like odour	
Hazards	Highly flammable. Inhalation of butane can cause euphoria, drowsiness, narcosis, asphyxia, cardiac arrhythmia, fluctuations in blood pressure and temporary memory loss, when abused directly from a highly pressurised container, and can result in death from asphyxiation and ventricular fibrillation.	
Exposure limits (NIOSH)	TWA	1900 mg/m^3 /800 ppm	not established

Hydrogen

Colorless, odorless flammable gas much lighter that air. Mixtures with air are explosive.
Results from the interaction of acids, bases and water with active metals and from electrolysis of aqueous solutions. In industrial production, the main source of hydrogen are hydrocarbons.

Chemical formula	H_2
Molar weight	2
Relative gas density (to air)	0.07
Conversion	1 ppm = 0.0818 mg/m^3
Boiling point	−252.88 °C
Low explosive limit (LEL), % vol in air	4.0
Upper explosive limit (UEL), % vol in air	75
Odour	Odourless
Hazards	Flammable, forms explosive mixtures with air. Asphyxiant.
Exposure limits	not established

Methane

Synonyms: Marsh Gas, Natural Gas, Carbon tetrahydride, Hydrogen carbide
Colourless flammable gas, main component of the natural gas, marsh gases.
Methane results from bacterial decomposition of plant and animal matter (landfill gas).
Methane is widely used as a fuel and chemical feedstock.

Chemical formula	CH_4
Molar weight	16
Relative gas density (to air)	0.55
Conversion	1 ppm = 0.65 mg/m^3
Boiling point	−161.49 °C
Low explosive limit (LEL), % vol in air	4.4* (5.0**)
Upper explosive limit (UEL), % vol in air	15

Odour	Odourless when pure. Methane used in the kitchens contains odorant
Hazards	Highly flammable, mixtures with air are explosive. Asphyxiant.
Exposure limits	not established

Propane

Propane is colorless flammable gas heavier than air.
Occurs in light petroleum fractions.
Propane is used mainly as a fuel and as a feedstock in organic synthesis. It is applied also as a propellant in aerosol sprays and may be used as ozone-friendly refrigerant.
Mixtures of propane with butane and other hydrocarbons are referred to as LPG (liquefied petroleum gas).

Chemical formula	$CH_8CH_2CH_8$
Molar weight	44
Relative gas density (to air)	1.55
Conversion	1 ppm =1.80 mg/m^3
Boiling point	−42 °C
Low explosive limit (LEL), % vol in air	1.7* (2.1**)
Upper explosive limit (UEL), % vol in air	9.5
Odour	Odourless when pure. Commercially available propane for fuel purposes may contain odorant ("gas smell").
Hazards	Highly flammable, mixtures with air are explosive. Asphyxiant. May cause dizziness, confusion, excitation when inhaled.
Exposure limits (NIOSH)	TWA	1800 mg/m^3 /1000 ppm
	IDLH	2100 ppm [10%LEL]

Terms and abbreviations

TWA: time-weighted average concentration for up to a 8-hour workday during a 40-hour workweek

STEL: 15-minute TWA exposure that should not be exceeded at any time during a workday

I**DLH** (immediately dangerous to life or health): likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment

PEL: permissible exposure limits

REL recommended exposure limits.
A ceiling REL is designated by **"C"** preceding the value; unless noted otherwise, the ceiling value should not be exceeded at any time.

NIOSH (National Institute for Occupational Safety and Health): the United States federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness.

NIOSH data are quoted in this manual where EU regulations are nor accessible.

Conversion of ppm to mg/m^3 is calculated for 25°C and 1 atm.
* according to new EU standards ('stirred' concentration of gas)
** according to US standard ('still gas' method)