

## Volatile Organic Compounds

Highly volatile organic liquids. The definitions of VOC may vary depending on application field and country. E2638-VOC is intended to detect vapors of solvents (acetone, benzene, ethanol, ethyl acetate, toluene, xylenes etc.

See Annex 2 for more information on the properties of various gases.

## Installation guidelines

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

Solvent vapors are heavier than air and tend to sink. Consider, if the vapours are heated or not, if the detector is used for fire safety (LEL range) or air quality control (0...100 to 0...1000 ppm range) etc.

## Calibration

E2638-VOC detectors-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. Please contact your dealer for more information.

## Delivery set

- Detector-transmitter E2638
- Mounting accessories:
  - 4 screws with plastic dowels
  - fixing clamp for remote probe version

E2638-VOC\_UM\_EN

Rev 10.12.2018

## Specifications

Sampling method	diffusion	
Sensor type	metal oxide semiconductor	
Default calibration	toluene	
Typical detection range	0...100% LEL	0...100 to 0...1000 ppm
Resolution / digital unit	0.1% LEL	1 ppm
Response time T90	< 120 s	
Sensor lifetime	> 5 years	
Calibration interval	12 months	
Signal update	every 1 second	
Power supply options	11...30 VDC or 24 VAC	
Power consumption	< 2 VA	
Analog outputs	2 × 4-20 mA / 0-10 V, user settable	
Load resistance	R <sub>L</sub> < (U <sub>s</sub> - 2 V) / 22 mA for 4-20 mA R <sub>L</sub> > 250 kOhm for 0-10 V mode:	
Outputs assignment	OUT1 2 gas; OUT2 2 gas <b>NOTE</b> for LCD version only output 1 is available	
Digital interface	RS485, Modbus RTU protocol no galvanic isolation	
Enclosure	grey ABS, wall mount, protection class IP65	
Dimensions	H90 × W145 × D55 mm (overall dimensions H140 × W145 × D55 mm)	
CE marking	according to 2014/30/EU and EN61326-1 requirements	
Operating conditions	-30...+70 °C; <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 silicone containing products	
<b>Relay option</b>		
Output relays	2 × SPST relays (closing contact), 250 VAC / 30 VDC, 5 A max	
Alarm setpoints (set/release)	RE1 (LOW): 20/16 % LEL; RE2 (HIGH): 50/40% LEL	RE1 (LOW): 100/80 ppm; RE2 (HIGH): 300/240 ppm (for 0...500 ppm range)
Visual alarm	Red and green LEDs (option)	
Acoustic alarm	Buzzer 85 dB (option)	
Power supply	mains 90...265 VAC power unit (option)	
<b>LCD indicator option</b>		
Operating temperature	0...+50 °C	
Display dimensions	72 × 36 mm	
Number of digits	3.5 7-segment	
Character height	14 mm	
Other features	Backlight	



## Solvent Vapors Detector-Transmitter E2638-VOC

### User Manual



Evikon MCI OÜ  
Tel. +372 733 6310

Teaduspargi 7, Tartu  
50411 Estonia

info@evikon.eu  
www.evikon.eu

**Evikon**

**E2638 series detectors-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. E2638 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.

The following features are available as option:

- Two relays RE1 and RE2 with closing contacts. Relay outputs can be used to switch alarm sirens, ventilation fans, shut-off valves or other actuators
- Integrated 230 V mains power supply module
- LCD indicator
- Remote probe. The remote probe is connected to the main unit with shielded cable. Default connection cable length is 3 m.

The version of your device is marked on the package.

### Safety requirements

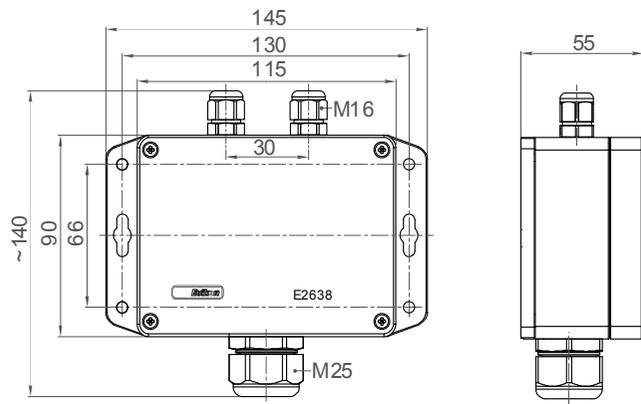
Always adhere to the safety provisions applicable in the country of use.

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.

### Mounting dimensions



### Installation

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

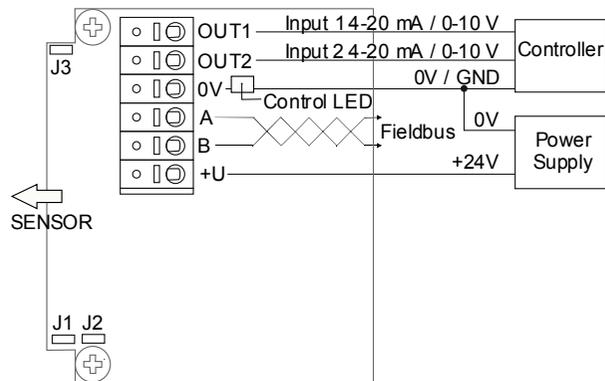
safety control the detectors are installed in the breathing zone (at the height of the head of people or animals). Recommended sensor position is vertical, pointing downwards. See **Installation guidelines** section on the next page for more information.

The device is mounted on the wall using four round holes or two key slots (see dimensional drawing in the previous section).

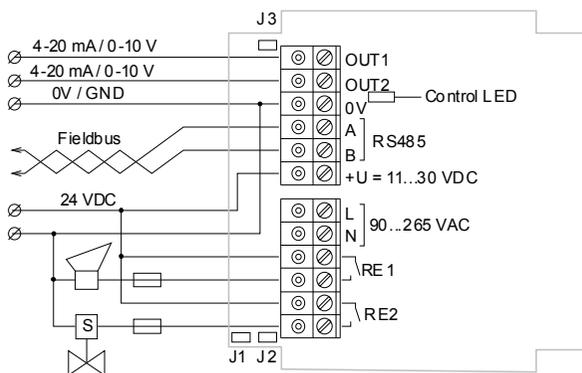
### Connections

1. Unscrew four lid screws and detach the lid from the device.
2. Attach the device to the wall. (This step may be done after the step 3, consider your convenience).
3. 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 diagrams below, connect the analog outputs, digital interface terminals and/or relays to the relevant devices according to your tasks.

#### E2638 basic version



#### E2638R version with relays



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 E2638 series devices are suitable for a wide range of wires with cross-section 0,2...1,5 mm<sup>2</sup>. 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 2x2x0,5 mm<sup>2</sup> 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.

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

**Note** The outputs are not galvanically isolated from 24 V power supply and share common 0V. Allowed load resistance limits are stated in Specifications table. To power the instrument from an external 24 VDC source, connect terminals 0V and +U to the source. If the integrated mains power supply module is used, connect terminals L and N to the mains.

**Note** Actuator short-circuits should be avoided, to protect the instrument relays use external fuses or safety switches.

4. Turn on the power. The sensor heating up may take up to five minutes after switching on. 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)
Relay1 turned on	Blinking 1 Hz (50% on, 50% off)
Relay2 turned on	Blinking 2 Hz (50% on, 50% off)
Modbus response	The signal is modulated with short on-off pulses, even single Modbus cycle is traceable*
Normal measurement	Continuous light

5. Make sure that the device is properly fixed, the external devices connected, power on and control LED is constantly lit. Make certain that the cable glands are properly tightened to ensure the conformity to IP65 protection class. Place the lid back and fix it with the screws. The device is ready to use.

It is recommended to keep the detector-transmitter powered constantly, except for periods of maintenance and calibration, deplacement etc.

### Remote sensor probe handling

The E2638 series devices are 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.



## E2638\_UM\_EN. Annex 1. E2658 series 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)	

### E2658R series 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	Holding register	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	RW	Response delay, ms	1...255	10
0x0007	7	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 <b>NOTE:</b> 3 and 4 are available starting from the Software version 0x218 (dec. 536)	1
0x0008	8	R	Last error code	1...255	-
0x0011	17	RW	Restarts counter	write '42330' to restart device (no response will follow)	-
0x0097	151	R	Sensor type code	0...65535	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



### E2638 series Modbus holding registers (part 3)

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	RW	Zero adjustment for temperature data, °C × 100	-32000...+32000 (-320,00...+320,00 °C)	0
0x00A5	165	RW	Zero adjustment for gas data, ADC	-32000...+32000 ADC units	0
0x00A6	1667	RW	Slope adjustment for gas data	1...65535	512
0x00A7	167	RW	Change rate limit for gas data, gas unit / s	1...32000, 0 - no limit	0
0x00A8	168	RW	Integrating filter time constant, s	1...32000 (seconds), 0 - no filter	0
0x00C9	201	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	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	RW	Forced value for analog output 1***	0...1000 (0,0%...100,0% of output scale)	0
0x00CC	204	RW	Forced value for analog output 2***	0...1000 (0,0%...100,0% of output scale)	0
0x00D3	211	RW	Parameter tied to relay RE1	0-none 1- temperature 2- gas concentration 9- control by Modbus control, state set in MHR / 40214	2
0x00D4	212	RW	Parameter tied to relay RE2	0-none 1- temperature 2- gas concentration 9- control by Modbus control, state set in MHR / 40215	2
0x00D5	213	RW	Forced state for relay RE1***	0- off, 1 - on	0
0x00D6	214/	RW	Forced state for relay RE2***	0- off, 1 - on	0
0x00D7	215	RW	Switching delay for relay RE1	0...1000 (s)	0
0x00D8	216	RW	Switching delay for relay RE2	0...1000 (s)	0
0x00D9	217	RW	Minimal on/off time for relay RE1	0...1000 (s)	0
0x00DA	218	RW	Minimal on/off time for relay RE2	0...1000 (s)	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

### E2638 series Modbus holding registers (part 3)

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	
0x00DB	219	RW	Control logic for relay RE1	0- none 1- relay on at high values 2- relay on at low values 3- relay on at values within the range 4- relay on for the values outside the range		0
0x00DC	220	RW	Control logic for relay RE2	0- none 1- relay on at high values 2- relay on at low values 3- relay on at values within the range 4- relay on for the values outside the range		0
0x00DD	221	RW	LOW setpoint for relay RE1	0...65535 (gas units)	see Specifications	
0x00DE	222	RW	HIGH setpoint for relay RE1	0...65535 (gas units)	see Specifications	
0x00DF	223	RW	LOW setpoint for relay RE2	0...65535 (gas units)	see Specifications	
0x00E0	224	RW	HIGH setpoint for relay RE2	0...65535 (gas units)	see Specifications	
0x00FF	255	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, bit[9]=0/1 - buzzer deactivated/activated bit[10]=0/1 - LED is on/off in normal condition bit[11]=0/1 - LED and buzzer syncing off/on with RE1 bit[12]=0/1 - LED and buzzer syncing off/on with RE2	user defined	
0x0100	256	R	Raw temperature data, °C×100	signed integer, -4000...+8500 (-40,00...+85,00 °C)		
0x0101	257	R	Raw gas sensor data	ADC data 0...4095		
0x0102	258	R	Measured temperature, °C×100	signed integer, -4000...+12500 (-40,00...+125,00 °C)		
0x0103	259	R	Gas concentration, gas units	signed integer, -32000...+32000 (gas units)		
0x0105	261	RW	0% value for analog output 1	signed integer, -32000...+32000 (ppm / ‰)	0	
0x0106	262	RW	100% value for analog output 1	signed integer, -32000...+32000 (ppm / ‰)	1000	
0x0107	263	RW	0% value for analog output 2	signed integer, -32000...+32000 (ppm / ‰)	0	
0x0108	264	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



## E2638-VOC User Manual

### Annex 2 Properties of VOC

#### Acetone

Synonyms/Trade Names: Dimethyl ketone, Ketone propane, 2-Propanone

Chemical formula	(CH <sub>3</sub> ) <sub>2</sub> CO	
Molar weight	58	
Relative gas density (to air)	2.0	
Conversion (at 25°C and 1 atm)	1 ppm = 2.38 mg/m <sup>3</sup>	
Boiling point	56.11 °C	
Low explosive limit (LEL), % vol in air	2.5	
Upper explosive limit (UEL), % vol in air	12.8	
Odour	Characteristic pungent smell	
Hazards	Highly flammable. Slightly toxic in normal use. Irritant causing mild skin irritation and moderate to severe eye irritation. At high vapor concentrations, it may depress the CNS.	
Exposure limits	8 hours (2000/39/EC)	1900 mg/m <sup>3</sup> / 500 ppm
	NIOSH REL TWA	590 mg/m <sup>3</sup> / 250 ppm
	IDLH (NIOSH)	2500 ppm [10%LEL]

#### Benzene

Synonyms/Trade Names: Benzol, Phenyl hydride

Chemical formula	C <sub>6</sub> H <sub>6</sub>	
Molar weight	78	
Relative gas density (to air)	2.69	
Conversion (at 25°C and 1 atm)	1 ppm = 3.19 mg/m <sup>3</sup>	
Boiling point	80 °C	
Low explosive limit (LEL), % vol in air	1.2	
Upper explosive limit (UEL), % vol in air	7.8	
Odour	Hyacinth-like odour	
Hazards	Highly flammable. Irritant. Carcinogen. May cause dizziness; headache, nausea, staggered gait; anorexia, lassitude. Target organs: eyes, skin, respiratory system, blood, central nervous system, bone marrow.	
Exposure limits (NIOSH REL)	Ca TWA	0.319 mg/m <sup>3</sup> / 0.1 ppm
	STEL 15 minutes	1 ppm
	Ca IDLH	500 ppm

#### Terms and abbreviations

**TWA:** time-weighted average concentration for up to a 8-hour workday during a 40-hour workweek. Any substance that NIOSH considers to be a potential occupational carcinogen is designated by the notation "**Ca**".

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

**IDLH** (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.

**REL** recommended exposure limits.

**NIOSH** (National Institute for Occupational Safety and Health): the US federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. NIOSH data are quoted if EU regulations are not available.

#### Ethanol

Chemical formula	CH <sub>3</sub> CH <sub>2</sub> OH	
Molar weight	46	
Relative gas density (to air)	1.59	
Conversion (at 25°C and 1 atm)	1 ppm = 1.89 mg/m <sup>3</sup>	
Boiling point	78.37 °C	
Low explosive limit (LEL), % vol in air	3 - 3.3	
Upper explosive limit (UEL), % vol in air	19	
Odour	Characteristic smell of alcohol	
Hazards	Highly flammable. Gas/air mixtures are explosive. Inhalation of vapours leads to cough, headache, fatigue and drowsiness. High concentrations may damage the fetus. Repeated high exposure may affect the liver and the nervous system.	
Exposure limits according to Commission Directive 2006/15/EC	TWA 8 hours	1210 mg/m <sup>3</sup> / 1000 ppm
	STEL 15 minutes	-

#### Ethyl acetate

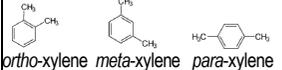
Chemical formula		
Molar weight	88	
Conversion (at 25°C and 1 atm)	1 ppm = 3.60 mg/m <sup>3</sup>	
Boiling point	77.1 °C	
Low explosive limit (LEL), % vol in air	2	
Upper explosive limit (UEL), % vol in air	11.5	
Odour	Sweet "pear" smell	
Hazards	Flammable. Short-term exposure to high levels of ethyl acetate results first in irritation of the eyes, nose and throat, followed by headache, nausea, vomiting, sleepiness, and unconsciousness.	
Exposure limits (NIOSH)	TWA 8 hours	1400 mg/m <sup>3</sup> / 400 ppm
	IDLH	2000 ppm [10%LEL]

#### Toluene

Chemical formula	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>	
Molar weight	92	
Conversion (at 25°C and 1 atm)	1 ppm = 3.77 mg/m <sup>3</sup>	
Boiling point	110.7 °C	
Low explosive limit (LEL), % vol in air	1.1 - 1.27	
Upper explosive limit (UEL), % vol in air	6.75-7.1	
Odour	Characteristic "chemical" smell	
Hazards	Highly flammable. Gas/air mixtures are explosive. Inhalation possible effects: irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paraesthesia; dermatitis; liver, kidney damage	
Exposure limits according to Commission Directive	TWA	192 mg/mm <sup>3</sup> / 50 ppm
	STEL	384 mg/mm <sup>3</sup> / 100 ppm

#### Xylene

(the term is used for any one of three isomers of dimethylbenzene, or a combination thereof)

Chemical formula	C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>		
Isomers			
Molar weight	106		
Conversion (at 25°C and 1 atm)	1 ppm = 4.34 mg/m <sup>3</sup>		
Boiling point	144.4 °C	139 °C	138.35 °C
Low explosive limit (LEL), % vol in air	0.9 - 1.1		
Upper explosive limit (UEL), % vol in air	6.0-7.0		
Odour	Characteristic "chemical" smell		
Hazards	Flammable. Inhaling can cause dizziness, headache, drowsiness, and nausea.		
Exposure limits according to Commission Directive 2000/39/EC	TWA 8 hours	221 mg/mm <sup>3</sup> / 50 ppm	
	STEL 15 minutes	442 mg/mm <sup>3</sup> / 100 ppm	