DrägerSensor® Dual IR Ex/CO_2 ES

Order no. 68 51 880

Used in	Plug & Play	Replaceable	Guaranty	Expected sensor life
Dräger X-am 5600	no	yes	5 years	> 5 years
Dräger X-am 8000	no	yes	5 years	> 5 years

MARKET SEGMENTS

Telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, mining, landfills, biogas plants, tunneling.

TECHNICAL SPECIFICATIONS

Detection limit:	1 % LEL for IR Ex (when calibrated with CH_4) 0.01 Vol.-% CO_2 for IR CO_2
Resolution:	1 % LEL for IR Ex 0.01 Vol.-% CO_2 or 50 ppm CO_2 (depending on set unit)
Measurement range:	0 to 100 % LEL/ 0 to 100 Vol.-% (depending on the respective target gas) 0 to 5 Vol.-% CO_2
Ambient conditions	
Temperature:	(-20 to 50) °C (-4 to 122) °F
Humidity:	(0 to 95) % RH
Pressure:	(800 to 1100) hPa (in potentially explosive atmospheres) (700 to 1300) hPa
Warm-up time:	≤ 3 minutes

TYPICAL MEASURING PROPERTIES FOR THE MEASUREMENT RANGE 0 TO 100 % LEL OR 0 TO 4.4 VOL.% CH_4 WHEN CALIBRATED WITH 2.5 VOL.% METHANE IN AIR*:

Response time:

	X-am 5600	X-am 8000
Diffusion mode (t_{50})	≤ 10 seconds	≤ 10 seconds
Diffusion mode (t_{90})	≤ 15 seconds	≤ 21 seconds
Pump mode (t_{50})	≤ 7 seconds	≤ 9 seconds
Pump mode (t_{90})	≤ 10 seconds	≤ 11 seconds

Precision	
Zero point:	≤ ± 1.0 % LEL
Sensitivity:	≤ ± 2 % LEL at 50 % LEL
Linearity error:	≤ ± 4 % of mesaured value or ≤ ± 1.5 % of the end of measurement range (the larger value applies in each case)
Influence of temperature (-20 to 50 °C)	
Zero point:	≤ ± 0.02 % LEL/K
Sensitivity:	≤ ± 0.1 % LEL/K at 50 % LEL
Influence of humidity, at 40 °C (104 °F) (0 to 95 % RH, non-condensing)	
Zero point:	≤ ± 0.01 % LEL/% RH

Influence of pressure of the respective measured value/hPa

	X-am 5600	X-am 8000
Zero point:	≤ ± 0.16 % (uncompensated)	≤ ± 0.06 % (compensated)

Long-term drift	
Zero point:	≤ ± 1 % LEL/month
Sensitivity:	≤ ± 3 % LEL/month at 50 % LEL

TYPICAL MEASURING PROPERTIES FOR THE MEASUREMENT RANGE 0 TO 100 % LEL OR 0 TO 1.7 VOL.% C_3H_8 WHEN CALIBRATED WITH 0.9 VOL.% PROPANE IN AIR*:

Response time:		X-am 5600	X-am 8000
	Diffusion mode (t_{50})	≤ 12 seconds	≤ 14 seconds
	Diffusion mode (t_{90})	≤ 40 seconds	≤ 57 seconds
	Pump mode (t_{50})	≤ 8 seconds	≤ 10 seconds
	Pump mode (t_{90})	≤ 13 seconds	≤ 15 seconds
Precision			
Zero point:	≤ ± 1.0 % LEL		
Sensitivity:	≤ ± 2 % LEL at 50 % LEL		
Linearity error:	≤ ± 3.0 % of mesaured value or ≤ ± 1.0 % of the end of measurement range (the larger value applies in each case)		
Influence of temperature (-20 to 50 °C)			
Zero point:	≤ ± 0.06 % LEL/K		
Sensitivity:	≤ ± 0.13 % LEL/K at 50 % LEL		
Influence of humidity, at 40 °C (104 °F) (0 to 95 % RH, non-condensing)			
Zero point:	≤ ± 0.01 % LEL/% RH		
Influence of pressure of the respective measured value/hPa			
	X-am 5600		X-am 8000
Zero point:	≤ ± 0.16 % (uncompensated)		≤ ± 0.06 % (compensated)
Long-term drift			
Zero point:	≤ ± 3 % LEL/month		
Sensitivity:	≤ ± 4 % LEL/month at 50 % LEL		

TYPICAL MEASURING PROPERTIES FOR THE MEASUREMENT RANGE 0 TO 5 VOL.-% CO_2 WHEN CALIBRATED WITH 2.0 VOL.-% CARBON DIOXIDE IN AIR*:

Response time:		X-am 5600	X-am 8000
	Diffusion mode (t_{50})	≤ 15 seconds	≤ 14 seconds
	Diffusion mode (t_{90})	≤ 31 seconds	≤ 48 seconds
	Pump mode (t_{50})	≤ 8 seconds	≤ 10 seconds
	Pump mode (t_{90})	≤ 11 seconds	≤ 14 seconds
Precision			
Zero point:	≤ ± 0.01 Vol.-%		
Sensitivity:	≤ ± 0.08 Vol.-% at 2.5 Vol.-%		
Linearity error:	≤ ± 10 % of measured value or ≤ ± 1.5 % of the end of measurement range (the larger value applies in each case)		
Influence of temperature (-20 to 50 °C)			
Zero point:	≤ ± 0.0002 Vol.-%/K		
Sensitivity:	≤ ± 0.015 % Vol.-%/K at 2.5 Vol.-%		
Influence of humidity, at 40 °C (104 °F) (0 to 95 % RH, non-condensing)			
Zero point:	≤±0.0001 Vol.-%/ % RH		
Influence of pressure of the respective measured value/hPa			
	X-am 5600		X-am 8000
Zero point:	≤ ± 0.15 % (uncompensated)		≤ ± 0.09 % (compensated)

Long-term drift	
Zero point:	± 0.005 Vol.-%/month
Sensitivity:	± 0.1 Vol.-%/6 months at 2.5 Vol.-%

* s. a. Notes on Approval 9033890 (X-am 5600), 9033655 (X-am 8000)

Test gases	2.5 Vol.-% CH_4 for measurement range up to 100 %LEL
	50 Vol.-% CH_4 for measurement range up to 100 Vol.-% CH_4
	0.9 Vol.-% C_3H_8 for measurement range up to 100 %LEL
	2 Vol.-% CO_2 for measurement range up to 5 Vol.-% CO_2

SPECIAL CHARACTERISTICS

This sensor allows a measurement of hydrocarbons (gases and vapors) and carbon dioxide simultaneously with just one sensor. As with all other IR sensors, it requires little maintenance, has a high level of long-term stability, and is highly resistant to poisoning.

COMPATIBLE GASES AND MEASUREING RANGES

Gas	Data set name	Measurement range **
n-Butane	buta	0 to 100 % LEL
n-BUTANE	BUTA	0 to 100 Vol.-%
Ethene	c2h4	0 to 100 % LEL
ETHENE	C2H4	0 to 100 Vol.-%
Ethanol	EtOH	0 to 100 % LEL
Ex	Ex	0 to 100 % LEL
JetFuel	JetF	0 to 100 % LEL
Liquid Petroleum Gas ***	LPG	0 to 100 Vol.-%
Methane	ch4	0 to 100 % LEL
METHANE	CH4	0 to 100 Vol.-%
n-Nonane	Nona	0 to 100 % LEL
n-Pentane	Pent	0 to 100 % LEL
Propane	c3h8	0 to 100 % LEL
PROPANE	C3H8	0 to 100 Vol.-%
Toluene	Tolu	0 to 100 % LEL

** The LEL information is dependent on the applicable country-specific standards.

*** The values in the table are based on 50% propane and 50% butane. In practice, the composition of LPG can fluctuate, which may lead to increased measuring errors.

DETECTING OTHER GASES AND VAPORS

Detection of other gases and vapors for the measuring range 0% to 100% LEL with the DrägerSensor Dual IR Ex/CO_2 ES or DrägerSensor IR Ex ES via cross-sensitivities used for technical measurements when calibrated with propane (C_3H_8, 100 % LEL = 1.7 Vol.%. Always observe these values for this application). The sensor can be used to detect the gases and vapors mentioned in the table. For this purpose, the sensor in the device must be configured to the target gas „Ex“.The specified values apply to 20 °C and may vary by ± 30 %. Calibration to the gas or the vapor can cause increased linearity errors.

RELEVANT CROSS-SENSITIVITIES

Gas/vapor	Chemical symbol	CAS No.	Test gas concentration in Vol.-%	Reading displayed in % LEL (if calibrated to 0.85 Vol% = 50 % LEL propane)	Cross-sensitivity factor f
Acetone	C_3H_6O	67-64-1	1.25	18	2.78
Acetylene	C_2H_2	74-86-2	–	not possible	–
Benzene	C_6H_6	71-43-2	0.60	20	2.50
Butadiene -1,3	C_4H_6	106-99-0	0.70	20	2.50
i-Butane	$(CH_3)_3CH$	75-28-5	0.75	41	1.22
n-Butane	C_4H_{10}	106-97-8	0.70	42	1.19
n-Butanol	$C_4H_{10}O$	71-36-3	0.85	25	2.00
2-Butanon (MEK)	C_4H_8O	78-93-3	0.75	22	2.27
i-Butene	C_4H_8	115-11-7	0.80	31	1.61
n-Butyl acetate	$C_6H_{12}O_2$	123-86-4	0.60	20	2.50
Cyclohexane	C_6H_{12}	110-82-7	0.50	15	3.33
Cyclopentane	C_5H_{10}	287-92-3	0.70	51	1.06
Diethylamine	$C_4H_{11}N$	109-89-7	0.85	44	1.14
Diethyl ether	$(C_2H_5)_2O$	60-29-7	0.85	46	1.09
Dimethyl ether	C_2H_6O	115-10-6	1.35	47	0.98
Ethane	C_2H_6	74-84-0	1.20	65	0.77
Ethanol	C_2H_6O	64-17-5	1.55	41	1.22
Ethene	C_2H_4	74-85-1	1.20	15	3.33
Ethyl acetate	$C_4H_8O_2$	141-78-6	1.00	35	1.43
Ethyl acrylate	$C_5H_8O_2$	140-88-5	0.85	26	1.92
n-Heptane	C_7H_{16}	142-82-5	0.55	36	1.39
n-Hexane	C_6H_{14}	110-54-3	0.50	34	1.47
Methane	CH_4	74-82-8	2.20	37	1.35
Methanol	CH_4O	67-56-1	3.00	92	0.54
n-Methoxy-2-Propanol	$C_4H_{10}O_2$	107-98-2	0.90	26	1.92
Methyl choride	CH_3Cl	74-87-3	3.80	47	1.06
Methylene chloride	CH_2Cl_2	75-09-2	6.50	20	2.50
Methyl tert-butyl ether (MTBE)	$C_5H_{12}O$	1634-04-4	0.80	59	0.85
n-Nonane	C_9H_{20}	111-84-2	0.35	on request	–
n-Octane	C_8H_{18}	111-65-9	0.40	20	2.50
n-Pentane	C_5H_{12}	109-66-0	0.55	36	1.39
Propane	C_3H_8	74-98-6	0.85	50	1.00
n-Propanol	C_3H_8O	71-23-8	1.05	40	1.25
Propene	C_3H_6	115-07-1	0.90	31	1.61
Propylene oxide	C_3H_6O	75-56-9	0.95	49	1.02
Toluene	C_7H_8	108-88-3	0.50	19	2.63
o-Xylene	C_8H_{10}	95-47-6	0.50	11	4.55

f = Specifications relate to the respective test gas concentration and the corresponding LEL.

The table does not claim to be complete. The sensor may also be sensitive to other gases and vapors.