Dräger X-pid® 9000/9500/9500+

Product Specification

V10 – 01.06.2024

Dräger. Technology for Life®

1 Overview sensor unit

The technical data of the control unit has to be considered separately in its instructions of use.

Ambient conditions:	
at operation	–10 to +35 °C 700 to 1300 hPa 10 to 95 % RH
Protection class	IP 54 Gas inlets and outlets have to be protected from water and dust. The water and dust filter has to be fitted at all times.
Operating times	typically 8 h, reduces with lower ambient temperatures
Dimensions	ca. 132 x 281 x 56 mm (W x H x T)
Weight	ca. 880 g
Approvals:	
ATEX	II 1G Ex ia IIC T4 Ga
IECEx	Ex ia IIC T4 Ga
cCSAus	Class I, Div. 1 Group A, B, C & D T4, Ex ia Class I, Zone 0, A/Ex ia IIC T4 Ga
CE Marking	RED (Directive 2014/53/EU) ATEX (Directive 2014/34/EU)
Measurement mode Seeker: (only 9x00)	
Sensor	10.6 eV PID (Seeker-PID) Sensitive for compounds < 10.6 eV ionization energy
Precision[1] (*k* = 1, ~68 %)	< 2 % at 10.0 ppm isobutylene < 2 % at 5.00 ppm benzene
Precision[1] (*k* = 2, ~95 %)	< 4 % at 10.0 ppm isobutylene < 4 % at 5.00 ppm benzene
Limit of detection[2]	0.01 ppm (isobutylene response)
Upper range[3]	60.0 ppm (isobutylene response)

[1] Measure for the repeatability of measurement results at identical circumstances. The precision was determined as the *k*-fold relative standard deviation (standard or expanded uncertainty, ~68 or ~95 % confidence interval) for measurements over the course of two days of five hours each with a break but no calibration between days. Therefore, with sufficient sample size, ~68% or 95 % of measurement results will vary less than the corresponding precision. The precision does not describe the difference from measurement results and true concentration that may actually be present.

[2] Lowest concentration that can be detected thus at which the sensor (PID) returns a signal. The limit of detection (LOD) depends on the sensitivity of the sensor. The LOD is valid for 100 % sensitivity of the respective PID, a parameter which is determined during calibration and that can be viewed in the archive in the user interface of the control unit.

[3] Highest concentration that can be measured thus at which the sensor (PID) returns a signal within the specification of the device.

Resolution	0.01 ppm from 0 to 9.99 ppm 0.1 ppm from 10 to 99.9 ppm 1 ppm from 100 ppm
Measurement duration	direct reading
Response time t_{90}	ca. 45 seconds (isobutylene, without hose)
Selectivity	Sum concentration assuming isobutylene response for entire signal. No selectivity between detectable compounds.

Measurement mode Analysis:	
Sensor	10.6 eV PID (Analysis-PID) after separation with gas chromatography Sensitive for compounds < 10.6 eV ionization energy and boiling point < 150 °C
Precision[1] (*k* = 1, ~68 %)	< 2 % at 10.0 ppm isobutylene < 2 % at 5.00 ppm benzene
Precision[1] (*k* = 2, ~95 %)	< 4 % at 10.0 ppm isobutylene < 4 % at 5.00 ppm benzene
Limit of detection[2]	Compound-specific, see technical manual 0.07 ppm isobutylene 0.02 ppm benzene
Limit of quantification[4]	Compound-specific, see technical manual 0.20 ppm isobutylene 0.05 ppm benzene
Upper range[3]	Compound-specific, see technical manual 100 ppm isobutylene 25.0 ppm benzene
Resolution	0.01 ppm from 0 to 9.99 ppm 0.1 ppm from 10 to 99.9 ppm 1 ppm from 100 ppm
Analysis duration	Compound-specific, limited by least volatile compound 20 s isobutylene analysis program 30 s benzene analysis program 30 s isobutylene & benzene analysis program
Response time t_{90}	none (if sample concentration at start of the analysis is at device)
Selectivity	Compound-specific, see technical manual For benzene there are no cross-sensitivities to toluene, ethylbenzene, xylene isomers, n-hexane and many other VOC with different volatility. Benzene has a known cross-sensitivity to cyclohexane.

[4] Lowest concentration that can be measured thus at which the sensor (PID) returns a signal within the specification, i.e. the precision of the device. The limit of quantification (LOQ) depends on the sensitivity of the sensor. The LOQ is valid for 100 % sensitivity of the Analysis-PID, a parameter which is determined during calibration and that can be viewed in the archive in the user interface of the control unit.
The LOQ is equal to three-times the LOD. At lower concentrations rising signals (“peaks”) in the chromatogram of measurement mode Analysis do not sufficiently differ from the noise of the sensor.

2 Target compounds (Analysis)

The Dräger X-pid® 9000 is limited to the target compounds benzene and 1,3-butadiene. For the Dräger X-pid® 9500/9500+ the following target compounds are qualified and quantified.

Target compounds	CAS number	t_R[5], s	LOD[2], ppm	LOQ[4],ppm	Upper range[3], ppm
Acetone	67-64-1	8.1	0.17	0.50	50.0
Acrolein	107-02-8	7.8	0.33	1.00	100
Benzene	71-43-2	19.3	0.02	0.05	25.0
Butadiene, 1,3-	106-99-0	6.4	0.07	0.20	25.0
Butyl acetate	123-86-4	64.3	0.67	2.00	220
Butyraldehyde	123-72-8	12.2	4.00	12.0	210
Carbon disulfide	75-15-0	9.8	0.33	1.00	110
Cyclohexane	110-82-7	20.3	0.67	2.00	200
Dichloroethene, 1,1-	75-35-4	8.9	0.07	0.20	50.0
Dichloroethene, cis-1,2-	156-59-2	13.4	0.07	0.20	50.0
Dichloroethene, trans-1,2-	156-60-5	10.9	0.07	0.20	50.0
Diethylcarbonat	105-58-8	48.4	4.33	13.0	1200
Dimethylcarbonate	616-38-6	14.6	1.67	5.00	500
Ethanol	64-17-5	7.5	1.67	5.00	500
Ethylbenzene	100-41-4	88.7	1.00	3.00	300
Ethylene	74-85-1	5.37	0.15	0.45	100
Ethylene oxide	75-21-8	6.8	0.33	1.00	100
Ethylmethylcarbonat	623-53-0	25.5	4.17	12.5	2000
Heptane, n-	142-82-5	27.1	5.00	15.0	500
Hexane, n-	110-54-3	13.7	0.33	1.00	100
Hydrogen sufide	7783-06-4	5.5	0.17	0.50	55.0
Isobutylene	115-11-7	6.3	0.07	0.20	100
Isopropyl alcohol	67-63-0	9.1	1.00	3.00	200
Methyl acrylate	96-33-3	14.4	0.67	2.00	200
Methyl bromide	74-83-9	6.8	0.17	0.50	100
Methyl methacrylate	80-62-6	27.7	2.50	7.50	275
Methylbutyraldehyde, 2-	96-17-3	19.3	0.33	1.00	110
Phosphine	7803-51-2	5.3	0.67	2.00	100
Propylene oxide	75-56-9	8.2	0.17	0.50	25.0
Propanol, 1-	71-23-8	11.6	5.00	15.0	550
Styrene	100-42-5	111.3	1.00	3.00	300
Tetrachloroethylene	127-18-4	58.9	0.67	2.00	150
Tetrahydrofuran	109-99-9	16.5	1.00	3.00	200
Toluene	108-88-3	41.6	0.33	1.00	100
Trichloroethylene	79-01-6	24.9	0.33	1.00	100
Vinyl acetate	108-05-4	11.9	0.33	1.00	55.0
Vinyl chloride	75-01-4	6.3	0.33	1.00	100
Xylene, m-	108-38-3	95.7	1.00	3.00	300
Xylene, o-	95-47-6	114.5	1.00	3.00	300
Xylene, p-	106-42-3	96.6	1.00	3.00	300

2.1 Qualified compounds

For the Dräger X-pid® 9500/9500+, further target compounds are qualified, but not quantified. Not always was the measurement range experimentally determined, instead no information is provided in these cases.

Target compounds	CAS number	t_R[5], s	LOD[2], ppm	LOQ[4],ppm	Upper range[3], ppm
Butanon, 2-	78-93-3	12.9	1.00	3.00	300
Butylacrylat	141-32-2	122.0	0.67	2.00	500
Chlorbenzol	108-90-7	75.6	1.00	3.00	200
Cyclohexanon	108-94-1	102.9	3.33	10.00	450
Dioxan, 1,4-	123-91-1	25.8	3.33	10.00	180
Epichlorhydrin	106-89-8	27.3	0.67	2.00	200
Ethylacetat	141-78-6	14.6	1.00	3.00	300
Ethylacrylat	140-88-5	24.9	1.00	3.00	200
n-Nonan	111-84-2	141.2	16.67	50.00	630
Propionsäure	79-09-4	80.1	4.33	13.00	1200
Butanol, 1-	71-36-3	20.5			
Cumol	98-82-8	151.6	-	-	-
Cyclohexen	110-83-8	22.9	-	-	-
Dimethyldisulfid	624-92-0	33.0	-	-	-
Isopentan	78-78-4	7.8	-	-	-
Isopren	78-79-5	8.9	-	-	-
Methylpentan, 3-	96-14-0	12.8	-	-	-
Methylpentan,2-	107-83-5	11.5	-	-	-

Qualified target compounds can be added to analysis programs and be assigned due to their retention time during analyses. The concentration calculation takes place using simplified assumptions as standards without the claim of high accuracy.
For more information see technical manual.
Technical manual Dräger X-pid® 8500/9000/9500 (draeger.com)

[5] Retention time