



Warsaw

USER MANUAL

edition 1allFU1

DEX/F

TWO-THRESHOLD GAS DETECTOR
EXPLOSION-PROOF
with an INTERCHANGEABLE SENSOR
models: **DEX-*nn*/N, DEX-*nE*/N,
DEX-*nK(L)*/N, DEX-*nR*/N**
[U1] series

BEFORE installing, read the USER MANUAL in its entirety.



To ensure safety during installation and operation of the detector, comply with the recommendations and warnings in this User Manual bearing this symbol.



Proceed only if you have fully understood of this Manual.

Keep this Manual for reference by the User of the gas detection system.

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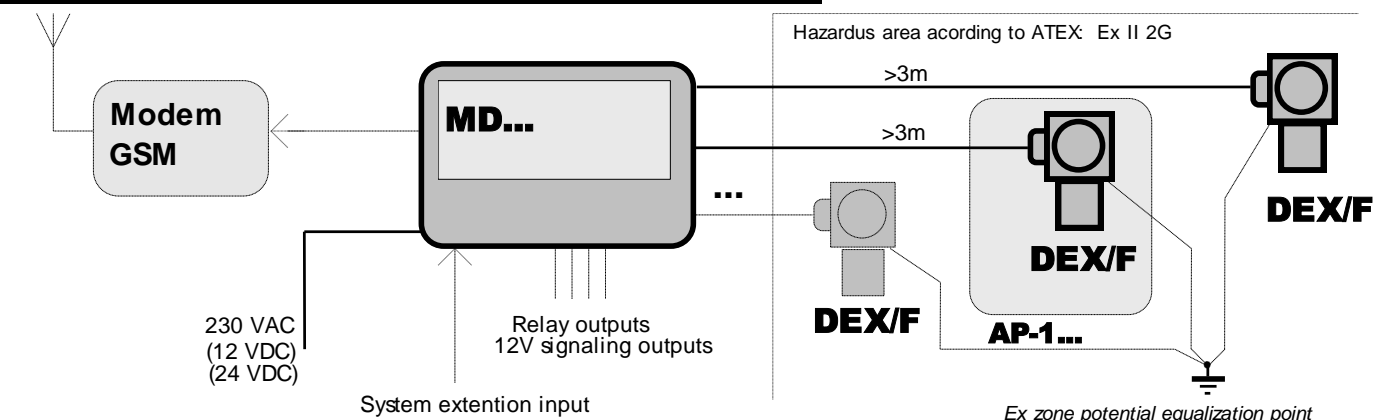
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DEFINITIONS AND DESIGNATIONS USED:

- gas detector** – hereinafter ‘detector’ – a device that converts the changing concentration of gas, mist, or vapour of a specific substance in the air into an electrical signal;
- sensor module** – a replaceable component of the gas detector containing a gas sensor (*an electronic component sensitive to changes in gas concentration in the air*).
- smart sensor** or **smart sensor module** – a sensor module equipped, among others, with a microprocessor-based control and regulation system, event memory, calibration period exceedance notification, and an automatic test procedure – detectors with such a sensor are marked with the letter ‘N’ in the model symbol;
- calibration gas** – a type of gas or substance vapour used to set alarm thresholds (*usually: the medium the device is designed to detect*);
- A1** – detector alarm status = indicates that the concentration of the calibration gas around the detector exceeds the value of the first (lower) alarm threshold or the concentration value of the first alarm threshold;
- A2** – detector alarm status = indicates that the concentration of the calibration gas around the detector exceeds the value of the first and second (higher) alarm threshold or the concentration value of the second alarm threshold;
- calibration** – verification of the detector or sensor module’s response to the calibration gas and adjustment of the threshold concentrations or measurement range to match the prescribed A1 and A2 values;
- short calibration certificate** – a document confirming the correct response of the detector (A1 and A2 status) to the medium specified in the document, at specified concentrations, under specified conditions;
- DEX/F** – DEX® type explosion-proof gas detector with a flameproof shield, in the following versions: F4-B, F4-BM, F4-HT-B, F4-HT-BM, F4-C, F4-CM, F4-S-C, F4-S-CM, F4-HT-C, F4-HT-CM, F6-B, F6-BM, F6-C, F6-CM; hereinafter ‘DEX’ or ‘detector’;
- TC-DEX** – cap for delivering test gases to the DEX detector enclosure – can be used when the detector is placed in IIA or IIB gas-hazardous zone;
- MD** – two-threshold alarm modules manufactured by GAZEX, types MD-(1, 2, 4)... or measuring modules MDP-(4, 8, 16)...;
- LEL** – the Lower Explosive Limit of a given flammable substance – the highest volumetric concentration of a mixture of a flammable gas or vapour with air, below which no explosion of the mixture can occur (*values for individual substances in accordance with PN-EN 60079-20-1:2010*);
- TWA** – Time-Weighted Average – the maximum allowable concentration of a harmful substance in the working environment (‘NDS’ pursuant to the Ordinance of the Minister of Family, Labour and Social Policy of 12 June 2018, Dz.U. [*Polish Journal of Laws*] 2018, item 1286, as amended);
- STEL** – Short-Term Exposure Limit – the instantaneous maximum allowable concentration of a harmful substance in the working environment (‘NDSch’ - as above);
- ppm** – parts per million (volume); **v/v** – volume per volume;
- <t₁/t₂** – time limit for the occurrence of a given factor described as ‘periodic’ or ‘instantaneous’ – means: over a period of time no longer than t₁ within a period of time no shorter than t₂;
- RH** – relative air humidity;
- electrical **cable** vs. **wire** – a connection cable is a collection of several insulated single-core conductors (*with copper cores, single-wire or multi-wire*) within a common insulating sheath;
- t_{P50}** – threshold detector response time defined as the time from the moment the calibration factor at a concentration/level twice the detector’s activation threshold is applied until the detector activates (*indicating the alarm threshold has been exceeded*) – assuming that the concentration value of this factor is within the detector’s measurement range.

Block diagram of the gas detection system



1. INTENDED USE

DEX®/F detectors are designed to detect the presence of hazardous concentrations of explosive, toxic gases or vapours, or oxygen in the air in enclosed spaces. They signal the exceeding of two alarm thresholds (A1, A2) set in the replaceable sensor module (thresholds are set during production). They are intended exclusively for use with **MD**-type alarm modules manufactured by GAZEX.

DEX detectors comply with the essential requirements of Directive 2014/34/EU (ATEX) of the European Parliament and of the Council of 26 February 2014, on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres, implemented by Ordinance of the Minister of Development of 6 June 2016 on the requirements for equipment and protective systems intended for use in potentially explosive atmospheres (Dz.U. [*Polish Journal of Laws*] 2016, item 817);

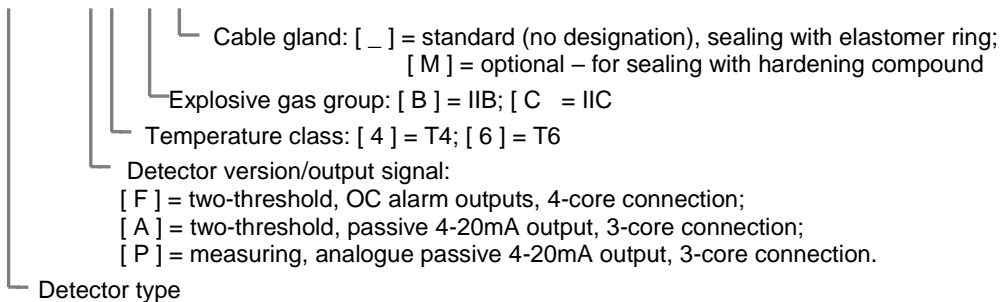
The detectors are explosion-proof devices with a flameproof shield and can be used in Zones 1 or 2 at risk of explosion from gases or flammable vapours classified in explosion groups IIA or IIB (for versions marked F...-B...) or in groups IIA, IIB, or IIC (for versions marked F...-C...), temperature classes T1, T2, T3, or T4 (for versions marked F4-...) or temperature classes T1, T2, T3, T4, T5, or T6 (for versions marked F6-...).

Application area according to ATEX Directive: Ex II 2G.

The DEX detector meets the standards: PN-EN IEC 60079-0:2018-09 [*EN IEC 60079-0:2018*], PN-EN 60079-1:2014-12 [*EN 60079-1:2014*]; and has an EU Type Examination Certificate (Module B): KDB 04ATEX133X, issued by the Central Mining Institute – notified body No 1453.

Nomenclature used on the nameplate:

DEX / F4-CM



DEX detectors have the following features:

DEX version	Feature*	DEX version	Feature
F6-B, F6-BM	Ex db IIB T6 Gb	F4-B , F4-BM, F4-HT-B, F4-HT-BM	Ex db IIB T4 Gb
F6-C, F6-CM	Ex db IIC T6 Gb	F4-C , F4-CM, F4-S-C, F4-S-CM, F4-HT-C, F4-HT-CM	Ex db IIC T4 Gb

*Standard versions marked in **bold** (others available on request)*

* – features required for carbon disulphide, phosphine, ethyl nitrite risks (temperature class T5, T6).

Since DEX incorporates a thermal compensation circuit, it can be used under variable ambient temperatures. DEX can be used outdoors with the use of a sun/rain shield and/or a splashproof enclosure type AP-1 or AP-1F (the certificate allows the use of AP-1... with detectors versions F6-B, F6-C, F4-B, F4-C if special requirements described in the AP-1 User Manual are met).

DEX-*n*KL/N models are resistant to mechanical shocks of up to 1.3 G (e.g., a fall from a height of up to 0.6 m) and can be used in motor vehicles.

Detectors intended for detection of gases and vapours heavier than air, installed in areas exposed to mechanical damage (warehouses, depots, car parks), can be equipped with a shield made of profiled tubes type AR-1d.

DEX®/F detectors are available:

with semiconductor smart sensor module – **DEX-*nn*/N** models,

with electrochemical smart sensor module – **DEX-*nE*/N** models,

with catalytic smart sensor module – **DEX-*nK*/N** and **DEX-*nKL*/N** models,

with Infra-Red smartsensor module (optical, infrared) – **DEX-*nR*/N** models,

where '*n*' is for digits comprising the code of the sensor module (calibration gas).

MS sensor modules for DEX-*nn*, DEX-*nn*/N, DEX-*nE*/N, DEX-*nK*/N, DEX-*nKL*/N, DEX-*nR* and DEX-*nR*/N are interchangeable, i.e. different modules can be used for the same DEX/F body (except for DEX-*nn.K* detectors).

Sensory modules with **DEX-*nn.K*** (marked MS-*nn.K* and MS-*nn.K*/N and MS-*nn.KL*/N) cannot be used in detectors other than those bearing the designation '**(*nn.K*)**' on the nameplate.

DEX-*nn*/N MODEL RANGE

The range of standard DEX-*nn*/N detectors with semiconductor sensors includes:

TABLE 1.1.nn

SYMBOL			Concentration RANGE							Calibration PERIOD		
Model	Standard version	Sensor module MS- ...	Gas / medium	Concentration range + selectivity	A1 min value (possible)***	A2 max value (possible)	Allowed temporarily (<1min/30min)	STANDARD CALIBRATION** A1/A2	Unit	Recommended max value [months]	Optimal [months]	Expected service life in clean air approx. [years]
DEX-12/N ^{ALH}	F4-C	12/N	methane (boiler rooms)	W	5	40	100	10/30 (p2)	%LEL	36	12	10
DEX-14/N ^{ALH}	F4-C	14/N	methane (selective)	W	5	40	100	10/30 (p2)	%LEL	36	12	10
DEX-14/N-S	F4-S-C	14/N	methane (selective, stainless steel encl. – waste plants and biogas installations)	W+SL	5	40	100	10/30 (p2)	%LEL	36	12	10
DEX-15/N ^{AL}	F4-C	15/N	propane, butane (boiler rooms)	W	5	40	100	10/30 (p2)	%LEL	36	12	10
DEX-22/NL ^{AL}	F4-C	22/NL	carbon monoxide	N+SL	20	1,000	2,000	20/100 (s15)	ppm	36	12	10
DEX-31/N	F4-B	31/N-X	organic comp.	W	5	40	50	20/40 (p2)	%LEL	12	12	10
DEX-41/N	F4-C	41/N-X	ammonia	W	500	5,000	10,000	500/1,500 (p2)	ppm	12	12	10
DEX-61/N	F4-B	61/N-X	CFCs*	W	100	3,000	10,000	1,000/2,000 (p2)	ppm	12	12	10
<i>DEX-71/N</i> ^{AL}	F4-C	71/N-X	acetylene, H ₂	W	5	40	100	10/30 (p2) H ₂	%LEL	12	12	10
DEX-73/N ^{AL}	F4-C	73/N-X	H ₂ (selective, battery rooms)	W	5	40	100	10/30 (p2)	%LEL	36	12	10

*Non-standard models, with parameters tailored to the application, are marked in italics and **RED**.*

^{AL} – in the standard version, the enclosure is aluminum, oxidised (marked '(AL)' on the nameplate); when operating in environments with aggressive gases, vapours with acidity pH < 4 or alkalinity pH > 9, or in high humidity environments (especially seawater), an optional model with a brass (nickel-plated) or stainless steel enclosure is available (316L);

* – calibration is also recommended before each important measurement/event relevant for the user;

** – A1/A2 values: (s15) = average value over the last 15 minutes, (p2) = instantaneous concentration value;

*** – parameters may depend on the selection of the sensor for a specific application; A1 value cannot be less than 20% of the A2 value;

^H – a model available in the F4-HT high-temperature variant (up to +80°C), marked as e.g., DEX-12/N-HT;

[#] - standard calibration concerns the R410A or R32 refrigerant.

Concentration range MARKING: SL - increased selectivity, N – concentrations considered low in metrological practice, W – concentrations considered high in metrological practice.

v/v – volume per volume; ppm – parts per million;

LEL – the lower explosive limit of a given flammable substance – the highest volumetric concentration of a mixture of a flammable gas or vapour with air, below which no explosion of the mixture can occur (values for individual substances in accordance with PN-EN 60079-20-1:2010).



NOTE: Detecting media in other ranges or different media is possible = special version, requires consultation with GAZEX; in particular cases, it is possible to tailor detector parameters to a specific application = ANALYSIS OF OPERATING CONDITIONS IS REQUIRED.

ATTENTION – IMPORTANT INFORMATION:



- The sensor used in the detector is resistant to **temporary** increases in the concentration of gases/substance vapours listed in Table 1.1.nn, column 7. However, prolonged operation of the detector (regardless of type) in conditions where gas concentrations exceed the value in column 7 is **UNACCEPTABLE** for all the media listed in the table! This may result in a permanent change in the detector's measurement parameters or complete damage to the gas sensor.
- It is **NOT** recommended to operate the detector for extended periods in concentrations above approximately 3÷5% LEL for explosive gases or above the A1 threshold concentration of a detector calibrated for toxic gases – this may cause the effects described above.
- The use of gases with uncontrolled concentrations for testing the detector's operation is **NOT** permitted!

DEX-nE/N MODEL RANGE

The range of DEX-nE/N detectors with electrochemical smart sensors includes models:

TABLE 1.1.nE

SYMBOL			Concentration RANGE							Calibration PERIOD		Expected service life in clean air approx. [years]
MODEL	Version	Sensor module MS-...	Gas	Concentration + selectivity	Measurement range****	A2 max value (recommended)	Allowed temporarily (<1min / 8h)	STANDARD CALIBRATION* A1/A2	Unit	Recommended max value [months]	Optimal [months]	
1	2	3	4	5	6	7	8	8A	9	10	11**	12****
DEX-2E/N^{AL}	F4-C	2E/N	carbon monoxide	SLK	20 to 500	300	1,500	TWA/STEL	ppm	12	6	2
DEX-4E/N	F4-C	4E/N-X	ammonia	SLK	500 to 1,000	800	2,000	500/800	ppm	6	3	2
DEX-7E/N^{AL}	F4-C	7E/N	hydrogen	SLK	50 to 1,000	600	2,000	500/800	ppm	6	3	2
DEX-9E5/N^{AL}	F4-C	9E5/N*****	oxygen	SLK	1 to 25	25	30	19/18	% v/v	24	24	5

SLK (col. 5) – selectivity as per Table 1.2.nE;

^{AL} – in the standard version, the enclosure is aluminum, oxidised (marked '(AL)' on the nameplate); when operating in environments with aggressive gases, vapours with acidity pH < 4 or alkalinity pH > 9, or in high humidity environments (especially seawater), an optional model with a brass (nickel-plated) or stainless steel enclosure is available (316L);

TWA/STEL – means thresholds: A1= TWA, A2= STEL;

* – threshold calibration (p2) for instantaneous concentration values is possible upon request;

** – calibration is also recommended before each important measurement/event relevant for the user;

*** – col. 12: exceeding the concentrations in col. 6 and exceeding the recommended operating temperatures shortens the sensor's lifespan and may necessitate calibration.

**** – upon request, in selected cases, it is possible to select a sensor with a higher concentration range;

***** – the stabilisation period of parameters after power is switched on or after a brief power outage is approx. 15 minutes; overestimation of oxygen concentration may occur for up to 2 hours (depending on the duration of the power outage) → the detector is intended for continuous operation; emergency power backup for the system with DEX-9E5/N is recommended!



NOTE: Detecting media in other ranges or different media is possible = special version, requires consultation with GAZEX; in particular cases, it is possible to tailor detector parameters to a specific application = ANALYSIS OF OPERATING CONDITIONS IS REQUIRED.

TABLE 1.2.nE Selectivity of electrochemical sensors – estimated response to test gases in [ppm]

Test gas - concentration -	CO 300 ppm	H ₂ S 15 ppm	H ₂ 1,000 ppm	SO ₂ 5 ppm	NO 35 ppm	NO ₂ 5 ppm	Cl ₂ 1 ppm	ethylene C ₂ H ₄ 100 ppm	ethanol C ₂ H ₅ OH 200 ppm	other	other
MS-2E/N response (1,000 ppm CO range)	300	0	< 400	0	< 3	0	0		0	NH ₃ : 0	CO ₂ : 0
MS-4E/N-X response (1,000 pm NH ₃)	0	0	0	-2	0	0			0		CO ₂ : 0
MS-7E/N response (2,000 ppm H ₂ range)	< 8	< 0.2	1,000	< 0.2	< 12	< 0.1	~0	< 25		NH ₃ (20 ppm): 0	CO ₂ (5%): < 500
MS-9E5/N response (25% v/v oxygen range)										Oxygen (20.9%): 20.9%	



TAB.1.2.nE: The influence of other gases is possible, but the extent of their impact is not provided by the electrochemical sensor manufacturer. The degree of influence of the gases listed may vary for concentrations different from those in the header. Empty spaces indicate the lack of data from the sensor manufacturer (should be interpreted as a potential, though unspecified, influence).

The data for Tables 1.1.nE and 1.2.nE were sourced from materials provided by electrochemical sensor manufacturers (updated November 2023). GAZEX assumes no responsibility for the reliability of the above data.

NOTE: When selecting a detector for a specific Customer application, GAZEX may use sensors with **different parameters than those listed above.**

DEX-nK(L)/N MODEL RANGE

The range of DEX-nK(L)/N detectors with catalytic smart sensors includes:

TABLE 1.1.nK

SYMBOL			Concentration RANGE							Calibration PERIOD		
Model	Version	Sensor module MS-...	Gas / medium	Concentration range + selectivity	A1 min value (recommended)	A2 max value (recommended)	Allowed temporarily (<1min/30min)	STANDARD CALIBRATION*** A1/A2	Unit	Recommended max value [months]	Optimal [months]	Service life* in clean air approx. [years]
1	2	3	4	5	6	7	8	8A	9	10	11**	12
DEX-1KL/N ^{AL H}	F4-C	1KL/N-X	explosive gases, (simple hydrocarbons)	W	10	50	110	10/30 (p2)	%LEL	12****	6	5
DEX-1KL5/N ^{AL H}	F4-C	1KL5/N-X	propane-butane	W	10	50	110	10/30 (p2)	%LEL	12****	6	5
DEX-3K/N ^H	F4-B	3K/N	organic comp.	W+SL	15	50	110	20/40 (p2)	%LEL	6	3	5
DEX-4K/N ^H	F4-C	4K/N	ammonia (hydrocarbons)	W+SL	3	20	50	5/15 (p2)	%LEL	6	3	5
DEX-7KL/N ^{AL H}	F4-C	7KL/N-X	hydrogen	W	10	50	110	10/30 (p2)	%LEL	12****	6	5

designations: W – concentrations considered high in metrological practice;

SL – increased selectivity (including low sensitivity to methane, reduced resistance to poisoning);

^{AL} – in the standard version, the enclosure is aluminum, oxidised (marked '(AL)' on the nameplate); when operating in environments with aggressive gases, vapours with acidity pH < 4 or alkalinity pH > 9, or in high humidity environments (especially seawater), an optional model with a brass (nickel-plated) or stainless steel enclosure is available (316L);

* – the sensor's durability in DEX-nK... is highly dependent on the presence of silicones, sulphur compounds, and other substances that may react with the catalyst on the sensor's active surface;

** – calibration is also recommended before each important measurement/event relevant for the user;

*** – A1/A2 values: (p2) = instantaneous concentration value;

**** – provided that the operation is checked using a test gas at least every 6 months;

^H – a model available in the F4-HT high-temperature variant (up to +80°C), marked as e.g., DEX-1K/N-HT;



NOTE: Detecting media in other ranges or different media is possible = special version, requires consultation with GAZEX; in particular cases, it is possible to tailor detector parameters to a specific application = ANALYSIS OF OPERATING CONDITIONS IS REQUIRED.



ATTENTION – IMPORTANT INFORMATION:

- The catalytic sensors used in the detector are not selective within the specified set of explosive (calibration) gases – they may react to any of the flammable gases and vapours listed in Table 1.2.nK below.
- The sensor used in the detector is resistant to **temporary** increases in the concentration of gases/substance vapours listed in Table 1.1.nK, column 7. Operation of the detector in gas concentrations exceeding those indicated in column 8 may cause malfunction of the detector (e.g., loss of alarm signals despite the presence of an explosive substance) or permanent changes in measurement parameters.
- The use of gases with uncontrolled concentrations to test the detector's operation is NOT permitted!

TABLE 1.2.nK Theoretical relative sensitivity of catalytic sensors: for DEX-1KL(1KL5,7KL)/N relative to methane = 1; for DEX-3K(4K)/N relative to n-pentane {=1}

Medium	Sensitivity coefficient	Medium	Sensitivity coefficient	Medium	Sensitivity coefficient
methane	1.00 {0.05}	n-octane	0.32	ethylene	0.63 {1.08}
ethane	0.68	methanol	0.78	hydrogen sulfide	0.46
propane	0.51 {0.94}	ethanol	0.63	carbon monoxide	0.79
n-butane	0.52 {0.82}	Isopropyl alcohol	0.44	ethylene oxide	0.49
isobutane	0.45	benzene	0.45	ammonia	1.43 {2.53}
n-pentane	0.51 { 1.00 }	toluene	0.42	hydrogen	0.81 {1.89}
hexane	0.40 {0.54}	o-Xylene	0.38	acetylene	0.63
heptane	0.42	acetone	0.60	JP-4 (jet fuel)	{1.39}

The data for Table 1.2.nK were sourced from materials provided by the catalytic sensor manufacturer. GAZEX assumes no responsibility for the reliability of the above data (updated July 2007). Coefficients for other media (if provided by the manufacturer) are available at GAZEX. The above coefficients should be regarded as approximate; they may differ from the actual values for a given sensor and may change over the course of operation.

DEX-nR/N MODEL RANGE

The range of DEX-nR/N detectors with Infra-Red (optical) sensors includes:

TABLE 1.1.nR

SYMBOL			Concentration RANGE							Calibration PERIOD		
Model	Version	Sensor module MS- ...	Gas	Concentration range + selectivity	A1 min value (recommended) ^{***}	A2 max value (recommended)	Allowed temporarily (<1min/30min)	STANDARD CALIBRATION* A1/A2	Unit	Recommended max value [months]	Optimal [months]	Service life in clean air approx. [years]
1	2	3	4	5	6	7	8	8A	9	10	11**	12
DEX-1R2/N ^{AL}	F4-C	1R2/N	methane	SL	5	50	++	10/30 (p2)	%LEL	36	12	>5
DEX-1R5/N ^{AL}	F4-C	1R5/N	propane, butane	SL	5	50	++	10/30 (p2)	%LEL	36	12	>5
DEX-3R/N	F4-B	3R/N-X	petroleum derivatives	SL	10	50	++	20/40 (p2)	%LEL	12	12	>5
DEX-8R/N ^{AL}	F4-C	8R/N	carbon dioxide (CO ₂)	SL	0.1	5 ^{***}	100	0.5/1.5	%v/v	36	12	>5

^{AL} – in the standard version, the enclosure is aluminum, oxidised (marked '(AL)' on the nameplate); when operating in environments with aggressive gases, vapours with acidity pH < 4 or alkalinity pH > 9, or in high humidity environments (especially seawater), an optional model with a brass (nickel-plated) or stainless steel enclosure is available (316L);

* – A1/A2 values: (p2) = instantaneous concentration value;

** – calibration is also recommended before each important measurement/event relevant for the user;

*** – parameters may depend on the selection of the sensor for a specific application;

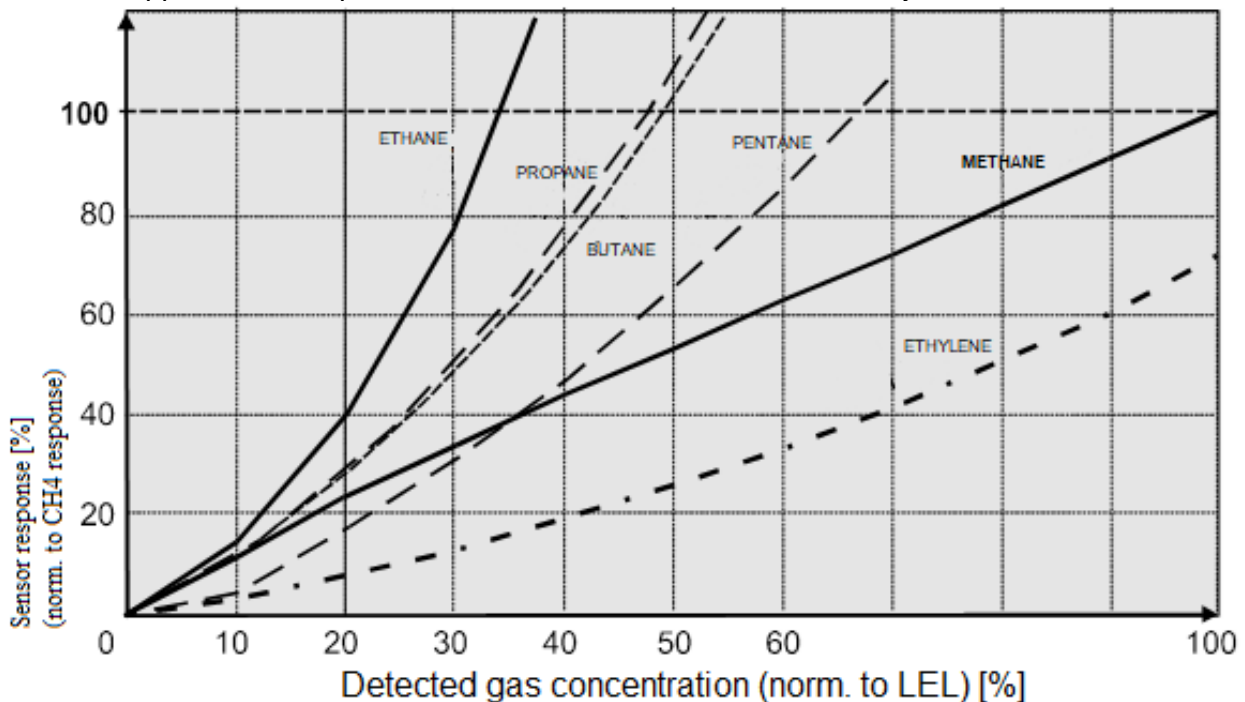
++ – no limitations regarding sensor durability;

SL – selectivity as per Figure 1.2.nR



Detecting other media or in other ranges is possible = special version, requires consultation with GAZEX; in particular cases, it is possible to tailor detector parameters to a specific application = ANALYSIS OF OPERATING CONDITIONS IS REQUIRED.

FIGURE 1.2.nR Approximate response of the Infra-Red sensor to selected hydrocarbons (relative to methane)



The influence of other gases is possible, but the extent of their impact is not provided by the sensor manufacturer. The data for Figure 1.2.nR were sourced from materials provided by the sensor manufacturer (updated 12 July 2015). According to these data, the sensor used in the DEX-8R/N model is selective (no cross-gases were specified). GAZEX assumes no responsibility for the reliability of the above data.

2. TECHNICAL PARAMETERS

TABLE 2.1. DEX/F - general parameters

System supply	9VDC nominal, unregulated; permissible range 6.0 to 9.0 V; permissible instantaneous (<30s/1 h) limits: 6.0 V ÷ 15 V
Power consumption	according to data for individual model ranges
Response time	as specified in the table below
Ambient temperature	recommended and occasionally permissible: as specified in the tables below; permissible limits (design values, excluding changes in metrological parameters) for use in the Ex zone: -30°C to +50°C for all versions (except F4-HT...); -30°C to +80°C for F4-HT...; -30°C to +45°C for DEX/F6-B, DEX/F4-B, DEX/F6-C, DEX/F4-C with additional AP-1... splashproof shield.
Detectable gases	according to Tables 1.1...
Alarm thresholds	A1, A2; calibrated within the range specified in Tables 1.1..., precise settings → in the calibration certificate attached to each DEX unit (or sensor module).
Alarm signal outputs	'1' – exceeding A1, '2' – exceeding A2, voltage-free, transistor-type OC, independent for each threshold; capable of direct connection to MD... modules.
Electronic circuits	manufactured using SMD technology, equipped with a built-in power supply control system and connection monitoring with the module; calibration period exceedance notification, built-in event history, automatic startup sequence, and sensor failure indication.
Dimensions and weight	103 x 105 x 54 mm (H x W x D) – in mounting position, without the mounting bracket; approx. 1.3 kg (ca. 0.5 kg aluminum enclosure)
Enclosure	IP65/IP6X, flameproof shield, material: nickel-plated brass (MO58 grade)(<i>unless otherwise specified</i>); or aluminum alloy(grade PA6), oxidised – only for standard models marked 'AL' in Tables 1.1... ; or stainless steel(316L grade) – for F4-S-C version, <i>e.g., standard model DEX-14/N-S</i>
Ex detector feature	Ex db IIB T6 Gb for F6-B, F6-BM versions; Ex db IIB T4 Gb for F4-B, F4-BM, F4-HT-B, F4-HT-BM versions; Ex db IIC T6 Gb for F6-C, F6-CM versions; Ex db IIC T4 Gb for F4-C, F4-CM, F4-S-C, F4-S-CM, F4-HT-C, F4-HT-CM versions
Ex detector certificate	KDB 04ATEX133X
Warranty	Standard Gazex 3-Year Plus Warranty (SGG3Y+) covering the period until the end of the year in which the device was manufactured and the following 3 years (<i>year of manufacture indicated on the nameplate => no warranty cards required</i>); extension option: up to 5 years (RGG5Y+); sensor modules in DEX: covered by Gazex Limited Plus warranty (OGG+).

TABLE 2.1.nn Selected DEX-*nn*/N model range parameters

Power consumption	typical: 90 mA, max approx. 180 mA (depending on the model)
Operating temperature (excl. F4-HT...), metrological constraints	recommended: -10°C to +40°C; occasionally permissible (<1h/24h): -20°C to +45°C; permissible: -20°C to +45 (without time limitation - with increased measurement error); with RH at 35% to 90% (without condensation on the sensor shield)
Gas sensor	semiconductor, interchangeable with a smart sensor module
Gases interfering with sensor operation	chlorine; nitrogen oxides; significant oxygen deficiency (<18% vol.); large, rapid increases in humidity
Factors limiting sensor durability	silicone compounds, operation above the concentrations specified in Table 1.1.nn, column 7, and the related notes, constant presence of strongly reducing gases such as acetylene, hydrogen sulphide, hydrogen, carbon disulphide, etc.
Response time	t_{P50} = 15 to 120 s (depending on the model and calibration level; excluding diffusion time to the detector); ±metrological readiness = from 0.5 h to 24 h depending on sensor type and duration of power outage
Accuracy of alarm threshold settings	relative error $\leq \pm 20\%$ under calibration conditions: 20(-2/+5)°C, RH 65(±10)%, atmospheric pressure 1,013(±30) hPa, >72 h of continuous power supply
Threshold stability	relative error $\leq \pm 15\%$, within the temperature range from 0°C to +40°C
Calibration period	recommended: < 36 or 12 months (indicated by cyclic activation of A2 output only); optimal: 12 months
Storage	store in a tightly sealed polyethylene bag in a place free from moisture, dust, exhaust fumes, and any chemically active substances (especially those containing silicones and derivatives), storage temperature: -20°C to +50°C

TABLE 2.1.nE Selected DEX-*nE*/N model range parameters

Power consumption	typical: 30 mA
Operating temperature, metrological constraints	recommended: -20°C to +40°C; occasionally permissible (<1h/24h): -25°C to +50°C; for DEX-4E/N – recommended: -30°C to +50°C with RH at 35% to 90% (without condensation on the shield)
Gas sensor	electrochemical, interchangeable with a smart sensor module
Gases interfering with sensor operation	as per Table 1.2.nE, significant oxygen deficiency (< 0.5% vol.); large, rapid changes in humidity
Gas sensor durability	2 years from the detector's production date; calibration as per Table 1.1.nE.
Factors limiting sensor durability	operation above concentrations listed in col. 6 of Table 1.1.nE, high concentrations of other gases. Even a brief increase in calibration gas concentration above the value in col. 8 is not permitted = requires calibration or may cause permanent damage.
Response time	t_{P50} = approx. 30 s for DEX-9E5/N; t_{P50} = 30 to 90 s for DEX-2E/N, DEX-7E/N; t_{P50} = 90 to 120 s; depending on the calibration; excluding diffusion time to the detector; metrological readiness from power on – approx. 5 min
Accuracy of alarm threshold settings	relative error $\leq \pm 15\%$ under calibration conditions: 20(-2/+5)°C, RH 65(±10)%, atmospheric pressure 1,013(±30) hPa, >72 h of continuous power supply
Alarm threshold stability	thermal: $\leq \pm 5\%$ for DEX-9E5/N; $\pm 10\%$ for others
(relative error related to calibration conditions)	long-term: gradual decrease in sensitivity (increase in A1 and A2 threshold values) - < $\pm 3\%$ per month, < $\pm 5\%$ per year for ...2E/N, < $\pm 5\%$ over 2 years for ...9E5/N; depends on the duration and intensity of sensor exposure to gases
Calibration period	recommended: < 6 months (exceedance indicated by cyclic activation of A2 output only); optimal: 3 months (exceptions as per Table 1.1.nE)
Storage conditions	in a tightly sealed polyethylene bag, in a place free from moisture, dust, exhaust fumes, and any chemically active substances; storage temperature from -20°C to +25°C. Calibration is required after 6 months from the production date (does not apply to DEX-9E5/N).

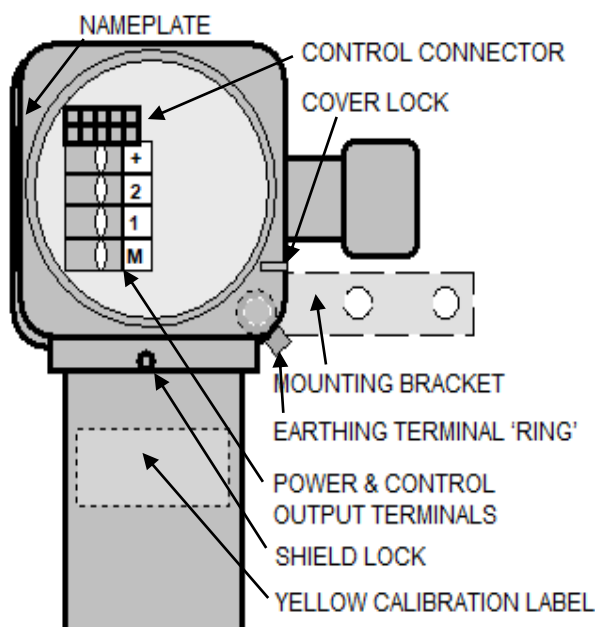
TABLE 2.1.nK Selected DEX-nK(L)/N model range parameters

System supply	9 V \pm nominal, unregulated; permissible range 6.5 to 9.0 V; permissible instantaneous (<30s/1 h) limits: 6.5 V \div 15 V for DEX-nK/N models – continuous power supply; for DEX-nKL/N models – continuous or intermittent – for intermittent supply, consider the initial detector warm-up time of 1 min and a minimum operating time to increment the internal runtime counter equal to 15 min
Power consumption	typical: 40 mA (<i>DEX-nKL/N models</i>), approx. 135 mA (<i>DEX-nK/N models</i>)
Gas sensor	catalytic, interchangeable with a sensor module
Response time	$t_{50} < 20$ s, $t_{90} < 60$ s (<i>for hydrogen</i>); metrological readiness = 1 min (<i>DEX-nKL/N models</i>); from approx. 20 min to several hours (<i>DEX-nK/N models</i>) – depending on the model and the duration of the power outage
Operating temperature, metrological constraints	recommended: -20°C to +40°C; occasionally permissible (<8h/24h): -30°C to +45°C; with RH at 35% to 90% (<i>without condensation on the shield</i>)
Detectable gases	flammable gases; according to Table 1.1.nK, column 4, and Table 1.2.nK
Factors interfering with sensor operation	significant oxygen deficiency (<10% vol.); hydrogen sulfide, halogen compounds (hydrocarbons containing fluorine, chlorine, bromine, iodine derivatives) – commonly found in solvents, cleaning agents, overheated PVC; rapid increase in airflow around the sensor (<i>only for DEX-nK/N models</i>)
Factors limiting sensor durability	silicone compounds (<i>lubricants, moulding and polishing pastes, adhesives, medicinal and cosmetic ointments, rubbers, etc.</i>); sulphur, lead, phosphorus compounds
Alarm thresholds	A1, A2; calibrated within the range specified in Table 1.1.nK, col. 6 and 7, precise settings \rightarrow in the short calibration certificate attached to each DEX unit (<i>or sensor module</i>)
Accuracy of alarm threshold settings	relative error $\leq \pm 15\%$ under calibration conditions: 20(-2/+5)°C, relative humidity 65(± 10) %, atmospheric pressure 1,013(± 30) hPa, minimum 24 h of continuous power supply
Alarm threshold stability	relative error $\leq \pm 15\%$ within the recommended operating temperature range; drift $\leq 5\%$ per month; tendency for sensitivity decrease (increasing alarm thresholds)
Calibration period	recommended: < 6 months or < 12 months (<i>exceedance indicated by cyclic activation of A2 output only</i>); optimal: 3 or 6 months; as per TABLE 1.1.nK
Storage	store in a place free from moisture, dust, exhaust fumes, and any chemically active substances (especially those containing silicones and derivatives), in a tightly sealed polyethylene bag; in a location free from vibrations and strong shocks; storage temperature: -20°C to +50°C

TABLE 2.1.nR Selected DEX-nR/N model range parameters

Power consumption	typical: 90 mA, maximum approx. 100 mA
Operating temperature	recommended: -30°C to +50°C; with RH at 0% to 90% (without condensation on the shield)
Gas sensor	optical Infra-Red (<i>NDIR – absorption of infrared radiation</i>), interchangeable with a smart sensor module; (can be replaced with a module containing a semiconductor or electrochemical sensor).
Detectable gases	hydrocarbons; for ...8R model – carbon dioxide (CO ₂)
Selected typical chemical compounds with minimal impact on the sensor	cyclohexanol, acetic acid, chloromethane, methyl formate, chloroethanol, nitroethane, ethylene oxide, furan, for others = contact GAZEX; (does not apply to ...8R model).
Typical chemical compounds with no impact on the sensor	hydrogen, acetylene, ammonia, carbon monoxide, carbon disulphide, hydrogen cyanide, phenol, dichloroethylene, dichlorobenzenes, aniline, acrylonitrile, tetrafluoroethylene; (does not apply to ...8R model).
Factors limiting sensor durability	heavy dust, strong mechanical shocks/vibrations
Response time	$t_{P50} = 40$ to 120 s \div (depending on the medium; excluding diffusion time to the detector); metrological readiness from power on – approx. 15 min
Accuracy of alarm threshold settings	relative error $\leq \pm 15\%$ under calibration conditions: 20(-2/+5)°C, RH 65(± 10)%, atmospheric pressure 1,013(± 30) hPa, >72 h of continuous power supply
Alarm threshold stability	relative error $\leq \pm 15\%$, within the temperature range from 0°C to +40°C drift $< \pm 2\%$ LEL per month; (...8R model: $< 0.02\%$ v/v per month); long-term drift over 1 year $\leq \pm 5\%$ LEL; (...8R model: $< 0.05\%$ v/v)
Calibration period	recommended: < 36 or 12 months (exceedance indicated by cyclic activation of A2 output only); optimal: 12 months
Storage	in a tightly sealed polyethylene bag, in a soft package; in a place free from moisture, dust, and any chemically active substances; in a location free from strong vibrations; at a temperature from -20°C to +50°C

3. DETECTOR DESCRIPTION / ORDER PICKING



Package contents for standard DEX/F detector:

- DEX detector (sensor shield mounted and locked; cover screwed on, but not locked) – 1 pc.
- mounting bracket (stainless steel, loose) – 1 pc.
- M5 metal screws (crosshead) for attaching the mounting bracket to the detector body – 2 pcs.
- 5 mm copper ring terminal for crimping the core (4 or 6 mm²) connecting to the equipotential bonding point in the Ex zone – 1 pc.
- 1.5 mm hex key (Allen) (for unscrewing the screws that lock the sensor shield and cover) – 1 pc.
- 'U' wrench/handle (for unscrewing the cover) – 1 pc.
- EU declaration of conformity for the detector – 1 pc.
- short calibration certificate for the sensor module – 1 pc.
- detector operating manual (may be included with the manual for the MD-type control module)

Fig. 3.1. View without cover

Example of DEX/F Designation

(photos A, B, C):

DEX-12/N model, F4-C version, aluminum housing, two-threshold, equipped with a semiconductor smart methane sensor, calibrated with methane

(thresholds: A1=10% LEL, A2= 30% LEL)

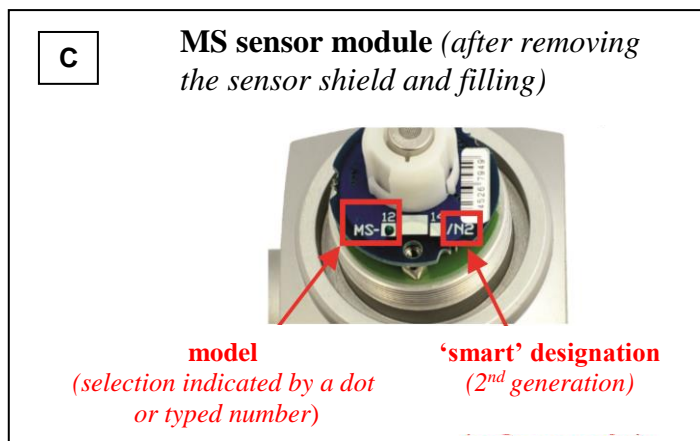
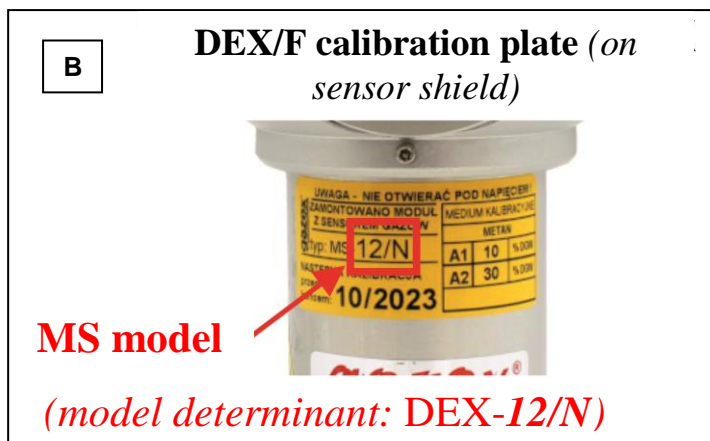
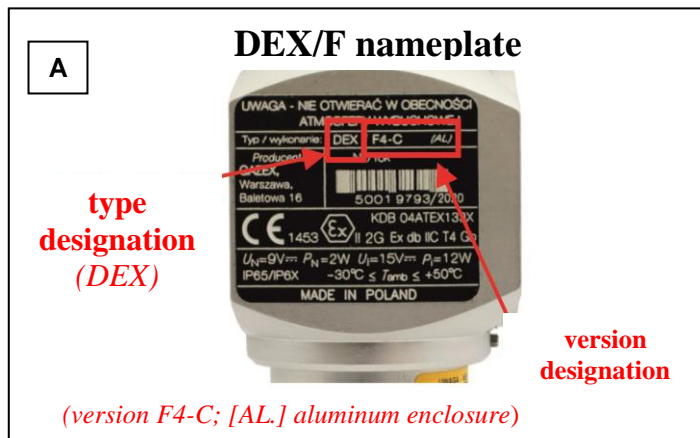


Fig. 3.2. DEX/F components:

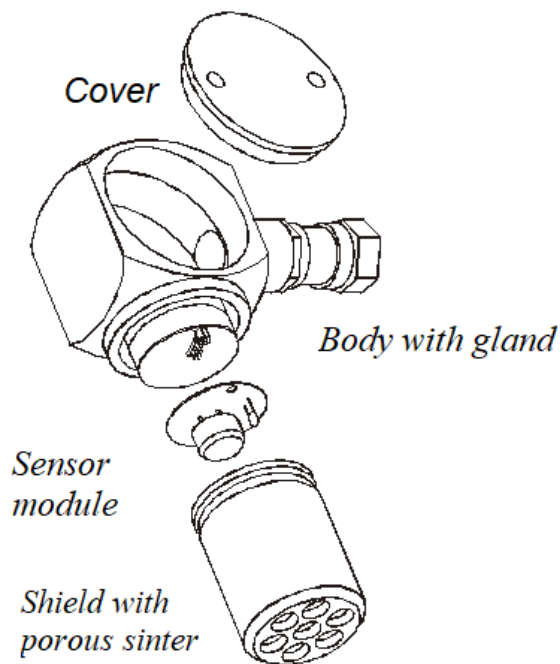


Fig. 3.3. BEFORE unscrewing the cover ==> unscrew the LOCKING screw:



4. INSTALLATION CONDITIONS



The user of the detector and the INSTALLATION TECHNICIAN must be aware of the special design and unusual use of the DEX[®] detector. This necessitates carrying out all installation and maintenance work with the **UTMOST CARE!**



Installation work in a zone classified as **Zone 1 or 2 hazardous areas for explosion** of gases, liquid vapours or mists can only be performed by individuals qualified in the operation of equipment in explosive hazard zones, in accordance with the relevant regulations.



4.1. The PLACE OF INSTALLATION of the detector on premises at risk of gas or vapours emissions has a **FUNDAMENTAL** effect on the correct operation of DEX. For this reason, the installation site should be determined by a competent specialist.

In many cases, it can be assumed that the best place to install the detector is **(general requirements):**

- as close as possible to the potential source of gas emissions (but no more than approx. **8 m** away; this distance may depend on factors such as the type and concentration of the medium, the nature of the emission sources, the ventilation of the room, and thermal conditions);
- in an area unexposed to sunlight, away from sources of strong electromagnetic fields (including mobile phones);
- away from supply vents, windows, doors;
- in a place not exposed to the direct influence of: outside air, water vapour, water or other liquids, cooking fumes, exhaust gases from furnaces, dust, mechanical impact, vibration, in a properly ventilated area – within the exhaust air stream;
- in a place where the detector can be **ACCESSED** and there is free space of at least 15 cm below the sensor shield (for future servicing).

And in addition (special conditions):

- 1) For DEX models calibrated for methane (natural gas, coke oven gas, biogas), acetylene, ammonia (lighter than air – accumulate in the upper areas of rooms):
 - on the wall, at a height **NOT LOWER than 30 cm** below the ceiling or on the ceiling;
 - **ALWAYS** above the top edge of doors, windows, or ventilation openings!
 - in a location **NOT** separated from the potential gas emission source by a barrier taller than 30 cm (such as a beam or ceiling tiles).
- 2) For DEX calibrated for propane, butane, pentane, hexane (or diesel fuel vapours, fuel oil), benzene, toluene (or other organic solvents), gasoline, alcohols (significantly heavier than air, accumulate in the lower areas of rooms):
 - on the wall or bracket, at a height **NOT HIGHER than 15 to 30 cm** above the floor level;
 - **NOT** above any depressions in the floor;
 - in a location **NOT** separated from the potential gas emission source by steps, thresholds, or floor channels.
- 3) For DEX designed to detect hydrogen (very light, tends to 'chimney' when emissions are high):
 - above the potential emission source, at a height just below the ceiling;
 - in rooms where lead-acid batteries are charged = **15 to 20 cm** below the ceiling.
- 4) For DEX calibrated for carbon monoxide (slightly lighter than air, easily mixes):
 - on the wall, support, or bracket at a height of approx. **180 to 200 cm**;
 - in a location where people are or may be frequently present.
- 5) For DEX designed to detect toxic gases at TWA, STEL levels or oxygen (workplace protection):
 - on the wall, support, or bracket **at a height of the working person's face**;
 - as close as possible to the workplace but always within the incoming air stream from the potential toxic gas emission source.

6) For DEX-8R/N designed to detect carbon dioxide (CO₂) (heavier than air, at high concentrations – accumulates in the lower areas of rooms):

- - on the wall or bracket, at a height of **approx. 50cm** above the floor level (for models designed to detect low concentrations of CO₂, i.e., A2 < 5,000 ppm, the height may be up to **180cm**);
- - NOT in the path of external airflow or within the ventilation supply stream;
- - out of the range of air exhaled by people (to avoid false alarms);
- - in a location NOT separated from the potential gas emission source by steps, thresholds, or channels.

The above-mentioned distances from the emission sources refer to an unimpeded diffusion zone, i.e., a temperature-homogeneous space, without heat sources, mechanical barriers restricting the flow of gases of vapours, forced air circulation, or gravitational ventilation. All of the factors mentioned can influence the proper placement of detectors.

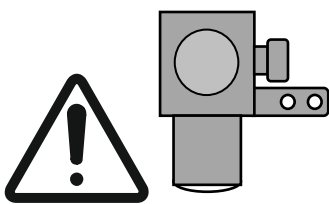


ATTENTION – IMPORTANT INFORMATION: If there are any changes that significantly affect the correct operation of the detector, such as a change in the type of hazardous/detected medium, reconfiguration of potential gas emission sources, reconstruction or change of purpose of the monitored room/area, or a change in its use, modifications to the electrical installation or ventilation/heating systems, or changes in the configuration of electromagnetic interference, it is imperative to **verify the selection of detectors, their placement, and cable connections!**

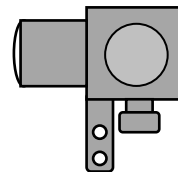
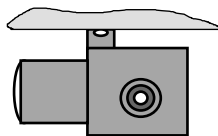
4.2. INSTALLATION POSITION: RECOMMENDED – VERTICAL, with the measuring chamber facing downwards!

For gases lighter than air horizontal installation is permissible – with the round cover facing sideways, provided that the detector is not exposed to moisture or other factors and the monitored room has a low level of dust – in this position, thermal compensation may not function correctly.

INSTALLATION POSITIONS:

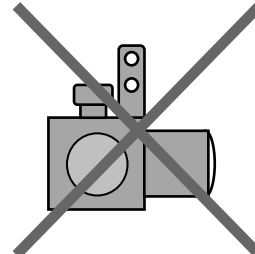
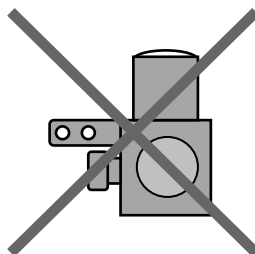


RECOMMENDED – vertical



or conditionally permitted* – **horizontal**

NOT PERMITTED:



* – not recommended for DEX-nK/N with catalytic sensor

5. DEX® INSTALLATION

5. When installing the DEX detector in an Ex zone with an explosion hazard, it is essential to follow the requirements of the PN-EN 60079-14:2014-06 standard. The following description pertains to the installation requirements when mounting the detector in such a zone, unless exceptions are clearly indicated for other cases. When installing DEX in an area where **no explosion hazard zone has been designated**, it is permissible to follow the requirements explicitly marked with a darker background in this User Manual. Compliance with these exceptions should be noted in the post-installation documentation of the gas detection system, specifying that they apply to DEX operation outside the Ex zone.



NOTE: When installing DEX in an **EXPLOSION HAZARD ZONE** marked 'EX,' the body of the DEX detector must be connected to the equipotential bonding system of accessible conductive parts (e.g., metal enclosures of devices) – earthing! This requirement arises from the potential for dangerous electrostatic charges to accumulate on the detector's enclosure, which could trigger an explosion in the surrounding explosive atmosphere. The connection of the DEX detector's enclosure to the equipotential bonding system – earthing – can be achieved in one of the following ways:

- I. Attaching the DEX detector body to a conductive structural element connected to the equipotential bonding system – earthing. The attachment method must be permanent and ensure reliable electrical contact.
- II. Creating a connection with an additional cable. One end of the cable should be crimped into the ring terminal supplied with the detector using the appropriate tool and the other end connected to the equipotential bonding system – earthing. A cable with a stranded copper core and a cross section of 4 to 6 mm² should be used (to ensure adequate mechanical strength). The ring terminal should be mounted under the head of the M5 screw that secures the bracket to the DEX detector's enclosure. If the detector is mounted without using the bracket, the ring terminal can be effectively connected to the detector body using the M5 screw that secures the detector.

When installing DEX in an area where **no explosion hazard zone has been designated**, earthing the detector's enclosure is not required.

5.1. Release the COVER LOCK of the terminal chamber by unscrewing the locking screw approximately 1.5 mm using the included hex key (Figure 3.3). Remove the terminal chamber cover by unscrewing it. Use the included 'U' shaped handle by inserting its ends into the recesses on the cover and turning counterclockwise. If there is significant resistance, use a wrench or screwdriver as a lever. Be careful not to damage the cover threads. Insert the four-core round cable through the gland and place the stripped wire ends into the terminals. CAUTION: Mechanical damage to the terminal board may result in IRREPARABLE damage to the electronic circuits, necessitating the REPLACEMENT of the mounting board, which is NOT covered by the WARRANTY!!!



5.1.1. The connection CABLE to a control module must be a uniform section of **at least 3 m** from the point of entry into the DEX detector. This requirement does not apply to detectors with cable entries sealed with a hardening compound (these detectors have the letter 'M' in their model name).

ONLY ONE, ROUND, FILLED cable is permitted. It is recommended that the cable is continuous throughout the entire length of the connection to the control module.

5.1.1.1. Recommended specifications for the connection cable:

- a) round with an outer diameter of **7.5 to 11.7 mm**;
- b) insulated copper cores, single or multiple, with a cross-section of 0.5 to 1.0 mm²;
- c) four-core cable with cores of different colours or markings;
- d) filled, with compact mechanical structure;
- e) flame retardant insulation according to PN-EN 60332-1-2;
- f) without shield or braid;
- g) when selecting a cable with single cores, it is recommended to use cables with at least **300/500 V**;
- h) when selecting a flexible cable with multi-wire cores, it is necessary to take into account the requirement for sufficient mechanical strength specified in section 9.3.3 of the PN-EN 60079-14:2014-06 standard. As this requirement is not precise in the standard, GAZEX recommends the use of flexible control cables with polyvinyl chloride (PVC) or similar plastic insulation, designed by the manufacturer for industrial applications, for permanent installation, including outdoors and directly in the ground, with a rated voltage of 0.6/1 kV.

Examples of recommended flexible cables: - BiT 1000 FR 4x0.75 or 4x1, manufactured by BITNER;
 - OLFLEX Classic 110 Black 0.6/1 kV 4x0.75 or 4x1, manufactured by LAPP.

The list of recommended cables for connecting DEX in Ex zones can be updated based on current cable supplier offers and is available from GAZEX upon request.

When installing DEX in an area where NO explosion hazard zone has been designated, the above recommendations are applicable in points **b)** and **c)**. In point **a)**, the recommended external cable diameter range is extended to **6.0 to 11.7 mm**. It is advised to use cables with an insulation class of **at least 300/500 V**.



The selected cable should have an appropriate fire reaction class. This requirement is related to the legislation on cables and wires as construction products – Regulation (EU) No 305/2011 (CPR) of the European Parliament and of the Council. The specific fire reaction class required for the cable, depending on the application, is detailed in standards such as N SEP-E-007:2017-09 or applicable legal acts as they are published.



The requirement for a specific outer cable diameter is **critical** due to the need for proper sealing in the gland.

For the high temperature version of the DEX/F4-HT... detector, the maximum operating temperature of the connection cable should not be less than 110°C.

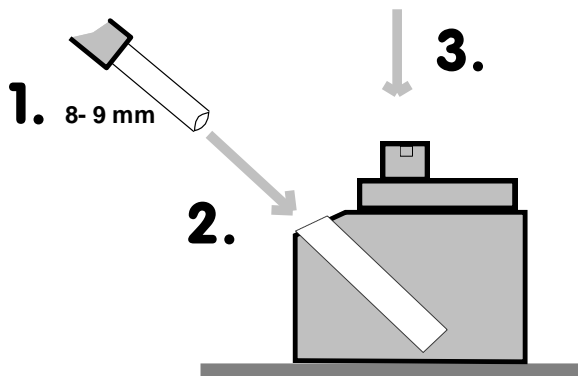
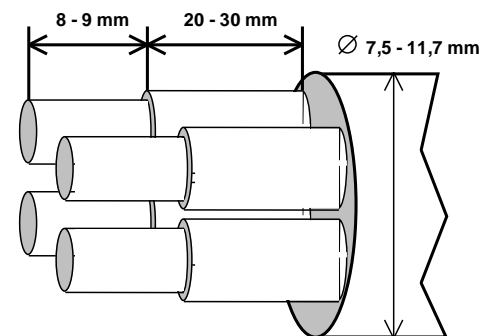
When installing DEX/F4-HT... in an area where NO explosion hazard zone has been designated, the above recommendations are applicable for a connection cable with a maximum operating temperature of **not less than 95°C**.

Due to the very low currents in the connection cable core, their cross-sectional areas are not critical. Only practical considerations such as the mechanical strength of the cables, availability and distance to the module result in a recommended core cross-section of **0.75 or 1.0 mm²**. The permissible length of the connection cable is given in the installation recommendations in the MD User Manual.

5.1.2. CORE ENDS:

The core tip, which is inserted into the terminal chamber of the detector, should be prepared in such a way that:

- the cores secured in the terminals do not need to be bent inside the detector;
- the external insulation of the core be removed to such an extent that the intact outer sheath of the cable (after the cable has been inserted and secured in the terminal strip) reaches the inner surface of the detector body.



5.1.2.A Inserting a

core into a **self-clamping** (angled) type terminal:

1. Remove core insulation over a section of 8 to 9 mm (**precisely!**).
2. Use pliers to push (insert) the stripped core end into the round opening of the terminal up to the stop.

A properly inserted core cannot be dislodged from the terminal.

To release and remove the core, press the grey pin above the core (as indicated by arrow 3).



5.1.3. The cable should be routed straight from the DEX cable gland, exactly along the axis of the gland. Non-axial routing of the cable can result in a loss of flameproof integrity at the point where the cable seals to the elastomer ring, which could invalidate the flameproof enclosure and Ex certificate for the detector. The first bend in the cable should start at least 2.5 cm from the end of the DEX cable gland. The cable should also be additionally secured to a fixed surface close to the DEX cable gland, i.e., not more than 30 cm from the end of the gland. The purpose is to fix the cable in

the correct position and provide additional protection against damage or pulling out of the gland. The cable exiting the detector should be formed into a 'U' or loop with the 'belly' pointing downwards as close to the detector as possible (this will prevent any water running along the connection cable into the detector gland and provide extra cable length for future adjustments to the connection end). The bend radius of each cable should be as recommended by the cable manufacturer. In the absence of a manufacturer's recommendation, the bend radius must be at least 10 times the outer diameter of the cable!

5.1.4. Route the connection cable to the location where the MD module is to be installed. Secure the cable along its entire length to the substrate or lay it in installation trays. Protect it from mechanical damage and chemical or thermal influences – especially in explosion hazard zones. Avoid running it together with high power control cables or other cables that may cause electromagnetic interference. The insulation class of the detector connection cable must not be lower than the insulation class of the cables used together. Use gas-tight cable transitions through shields and structural elements adjacent to the explosive hazard zone. It is generally recommended (and required where cables are routed through areas accessible to unauthorised persons) that the connection cable is routed in a metal or plastic conduit. This will protect the system from accidental or intentional damage.



In an explosion hazard zone, only use cable conduits made of earthed metal pipes or plastics that do not accumulate electrostatic charges, or long elements made of any plastic, provided the projection does not exceed 25 mm.

If it is necessary to extend the cable ('splicing,' i.e., joining cables), and the connection is in an explosive hazard zone, use an explosion-proof 'Ex' junction box with at least four terminals (available from GAZEX). The cable connecting the junction box to the control module should then meet the requirements listed in section 5.1.1.1:

a) with an outer diameter selected for the cable gland used in the junction box, b) with core cross-sections appropriate for the terminals in the junction box, d), e), g), h).

If the cable joint falls in an area NOT covered by the Ex zone for gas, dust, or vapour hazard, the connection can be made in a sealed installation box with a protection rating of at least IP54.

5.1.5. IMPORTANT:

The cable should be clamped firmly enough in the DEX detector gland so that the cable does not slip out of the detector when attempting to pull it out by hand (and does not transmit mechanical forces to the detector connection terminals). In this way, the detector gland will be properly sealed.

5.1.6. Tightening the terminal chamber cover

When installing the cover, ensure that the threads are clean and that the rubber gasket is correctly positioned to provide a complete seal for the cover. The cover should be tightened using the included 'U' shaped handle by inserting its ends into the recess on the cover, turning clockwise until tight. In the case of difficulty in tightening, use a flat spanner or screwdriver as a lever. Lock the cover by screwing the COVER LOCK screw with a hex key until resistance is felt.

5.2. Mount the detector on the bracket with the measurement chamber facing downwards so that the inlet to the chamber with the sensor is positioned at the recommended height (depending on the gas being detected) as per section 4.1. It is essential to use two screws to secure the bracket. The installation should ensure access to the detector for maintenance and service activities.

5.3. It is important to ensure that the detector is not exposed to mechanical damage (optionally, a protective cover made of AR-1d profiled tubes can be used) or to flooding by water or other agents (optionally, a splashproof shield AP-1... can be used; however, this extends the detector's response time!).



DAMAGE of the measuring chamber of the DEX detector by water or other liquids causes irreversible **DESTRUCTION** of the gas sensor! In such a case, sensor replacement is **NOT** covered by the warranty!!!

5.4. Connect the connecting cable to the MD, ensuring the correct order of all cores!

Incorrect wiring order of the cores connected to the DEX detector outputs will cause an MD emergency.


5.4.1. Connect the power supply to the MD module or the system control panel, and check the proper power supply indication for the system.

IMPORTANT: DEX® must not be powered unless the terminal compartment cover is properly secured, the cable gland is sealed, and the sensor shield is screwed on and locked. The DEX® power supply must **ONLY** be switched on with the terminal chamber open (for calibration or operational checks) if the gaseous atmosphere around the detector is safe and continuously monitored by a suitable explosimeter.



5.4.2. After powering on the detector, a sensor warm-up cycle in DEX® begins, lasting from approximately a few to several dozen seconds or even a few minutes (depending on environmental conditions, the sensor used, and the duration of the power interruption). During this time, the detector may incorrectly indicate an alarm threshold being exceeded or not exceeded. Signals from the detector during this period should be ignored. The signal masking (ignoring) period is set or adjusted in MD... type control modules.

5.4.2.A For detectors equipped with a smart sensor module MS (*with the letter 'N' at the end of the symbol on the yellow, rectangular calibration label*), upon powering on the detector, an automatic, one-time start-up sequence occurs: a 'high' status only on output '2' for a few seconds (during processor start-up) → generation of a normal status on the outputs (a 'low' status on both) for approximately 4 seconds → a pulsing signal only on output '1' for approximately 4 seconds → a pulsing signal only on output '2' for approximately 4 seconds → pulsing signals on both outputs for approximately 4 seconds → returning to the normal status on both outputs. The signals can be monitored with a voltmeter at the detector terminals or observed on the MD alarm module. Under normal conditions, the above start-up sequence is 'unnoticed' by the MD. To observe it, preheat the MD module without powering on the detectors (by turning off all detectors in the MD-2/4... using the function switch). Then, power on the individual detectors one by one. The observed lights on the front panel or letters on the display can confirm the correct wiring order.

 The start-up sequence is presented for illustrative purposes. The start-up sequence described above may vary depending on the type/model of the MS sensor module installed in the detector. The sequence may have a different timing or may be interrupted if errors in the sensor or detector malfunctions are detected.

5.4.3. PLEASE NOTE: The warm-up cycle may also occur after a power interruption in DEX®. The length of the cycle depends on the duration of the interruption; therefore, ensuring an uninterrupted power supply to the system is essential!

5.4.4. WARNING: The MD control module must be installed outside the EXPLOSION HAZARD ZONE!!!

5.5. The final stage of installation is a final check of the DEX® + MD operation.

5.5.1. Ensure that the detector is properly powered, that the warm-up cycle has been completed (appropriate module status), and that the detector's power supply continuity has been maintained for at least 30 minutes, and the porous sinter in the sensor shield is completely dry.

5.5.2. Generate the detector alarm statuses:

Using a TC-DEX type test cap (the detector is placed in IIA or IIB gas-hazardous zone), apply test gas at a flow rate of approximately 0.5 l/min. The type of test gas should be as described in the calibration certificate for the particular detector and its concentration should be at least 10% LEL (for explosive media) or at least 20% of the tested alarm threshold (for low concentration toxic media) above the alarm threshold tested. The alarm status in MD should be monitored after several dozen seconds.

A detector with a catalytic sensor may be tested using a test gas other than the calibration gas, provided that the sensitivity coefficient values of the calibration and test gases (from Table 1.2.nK) do not differ by more than 50% and the calculated relative concentration does not exceed the measurement range of the detector tested.

5.5.3. Testing a detector with gases of unspecified/incorrect concentrations may lead to temporary or permanent sensor damage or necessitate recalibration (**which is NOT covered by the WARRANTY!**).

Following a positive test result,
the **DEX® detector** can be considered operational and started up.

Note:

The detector with semiconductor sensor reaches its full measurement performance after at least 24 h of uninterrupted power supply!!!

The detector with electrochemical sensor reaches its full measurement performance after at least 24 h of uninterrupted power supply!!!

Note: DEX-9E5/N is sensitive even to brief power interruptions and may overestimate oxygen concentration readings after such an event—returning to normal operation may take up to 2 hours.

A detector with a catalytic sensor reaches full measurement efficiency after at least 20 minutes of uninterrupted power (and may require up to several hours)!!! For DEX-*n*KL/N models, metrological readiness is achieved after a minimum of 1 minute.

A detector with an optical (Infra Red) sensor reaches full measurement efficiency after at least 15 minutes of uninterrupted power.

The date and name of the person performing the installation, along with the serial numbers of all detectors installed in the system, must be recorded in the Periodic Inspection Record attached to the MD. The individual short calibration certificates for the detector should be stored with the Record.

If there are any uncertainties or doubts regarding the installation and operation of the DETECTOR, please contact an Authorised Service Centre or the MANUFACTURER.

6. MAINTENANCE / OPERATION

6.1. Due to the long-term durability of the DEX[®] detector's semiconductor components, maintenance is limited to:

A) Periodic dust removal from the porous sinter shield through vacuuming, checking the tightness of the cable gland and the cover;

Periodic system operation inspection according to the procedures in Chapter 5.5. of this Manual.

The recommended frequency for periodic inspections is not less than every 3 MONTHS. (see NOTE 6.6. below)

The check based on the procedure in 5.5. is also mandatory after any system power restoration following an interruption longer than 3 days (excluding DEX-*n*KL/N and DEX-*n*R/N models) and after the occurrence or suspicion of gas concentrations exceeding the values specified in Table 1.1.nK, column 8.

C) In cases of high humidity in the monitored room or exposure of the connecting cable or the detector itself to water splashes, the above procedure should be supplemented by checking the tightness of the detector's gland:

- Turn off the detector (system) power, wait 10 min, and check that there is no explosive gas atmosphere around the detector.
- Remove the detector's round cover (after loosening the locking screw).
- Check if the terminal chamber or connection terminals are damp, covered with deposits, or show signs of corrosion. In such a case, the terminal chamber must be thoroughly dried, the gland sealed (tightened), and water droplets should be removed from the area around the gland (using flanges, cable sleeves, a 'U' loop in the cable before the gland, etc.).
- Reinstall the cover (if the threaded surfaces show signs of corrosion but without pitting, coat them with a thin layer of clean technical petroleum jelly), and tighten the locking screw.
- Perform a check according to the procedure in Chapter 5.5.

When maintaining the DEX detectors placed in an Ex zone with an explosion hazard, it is essential to follow the recommendations of the PN-EN 60079-17:2014-05 [EN 60079-17:2014] standard.

The user of the DEX detector should be aware that the correct (no false alarms) and long-term (cost-effective) operation of the detector largely depends on the correct installation of the detector and **properly functioning ventilation** in the monitored room!



6.1.1. Since catalytic and electrochemical gas sensors have a natural tendency to decrease sensitivity over time, it is necessary to perform a regular check and calibration of detectors equipped with such sensors. The recommended calibration interval is according to Table 1.1... This task can be performed for a fee by the Manufacturer or an Authorised Service Centre after the MS sensor module is removed from the detector and delivered to them.

Calibration may also be necessary after **any** occurrence of factors that disrupt the gas sensor's operation (Tables 2.1...). In such cases, sensor replacement may be required—a paid service provided by the Manufacturer!

As the semiconductor gas sensor may have a natural tendency for increased sensitivity over time, an excessive lowering of the alarm thresholds may occur after a period of approximately 3 years of operation (see Technical Parameters – Long-term stability). This does not change the operation of the detector, but in such situation, it is nevertheless **recommended** (especially if the User notices frequent reactions of the system to relatively low gas concentrations) to calibrate the device, i.e. adjust the setting of the alarm levels,

at least every 3 years of detector operation.



The expiry of the recommended calibration period for each sensor is visually indicated on the MD (without affecting the functionality of the outputs, while maintaining full alarm capability):

the [PWR] lamp flashes rapidly (several times per second) or a message appears on the display (for MDP... modules). Calibration can be carried out by the Manufacturer or an Authorised Service Centre on site or after the sensor module SM has been delivered to the above-mentioned entities.

Dismantling of the sensor module by the User and sending it back to the Manufacturer for calibration seems to be the fastest and the most economically justified way of maintaining full functionality of the device.

6.1.2. If it is necessary for the detector(s) to be in an atmosphere with gas concentrations exceeding any of the 'Allowed temporarily' values given in Table 1.1... (column 8) or if the concentration remains above the A2 threshold for an extended period, the system **MUST BE SHUT DOWN**, i.e., the mains power supply should be switched off, the back-up battery (if connected) should be disconnected, and all detectors should be sealed with gas-tight polyethylene film (including the entire body). Before turning the system back on, ensure that the concentration has fallen to a level below the A2 threshold.



6.1.3. NOTE: ALL results of the periodic inspection, any malfunctions noticed in the detection system, system power interruptions and the detectors' operation under extreme conditions must be recorded in the **Periodic Inspection Record** attached to the MD or the warranty rights will be lost.

6.1.4. When working in humid or highly corrosive environments, it is essential to monitor the condition of threaded connections (covers and shields). The recommended monitoring frequency is no less than once every 12 months. It is crucial to remember that any corrosion pitting on the threaded surface of any part of the detector **disqualifies** the DEX enclosure as explosion-proof!

For the maintenance of the sensor shield threads and the locking screws on the cover and shield, use only technical petroleum jelly or greases without silicone additives, applying a thin layer.

6.2. IMPORTANT:



Maintaining the gas permeability of the porous sinter in the cylindrical detector cover is **FUNDAMENTAL** to the PROPER operation of the DETECTOR!

Therefore, if the Detector operates under particularly harsh conditions, such as:

- in environments with a very high dust level (e.g., coal dust, ash),
- in the presence of oily vapours,
- in the presence of paint or lacquer fumes,

special attention must be given to keeping this shield properly clean!

6.2.1. The first signs of obstruction in the cylindrical detector cover are a prolonged response time to the test gas (much longer than normal!) or a complete lack of response.

In such a case, the following steps should be taken:

- Turn off the detector's power (this is essential! In systems with emergency power, turn off the power supply and **DISCONNECT THE BATTERY!**); wait approx. 10 minutes.
- Ensure that there is no explosive gas atmosphere near the detector!
- Remove the cylindrical detector cover:
 - Loosen the locking screw of the cover with a hex key (commonly known as Allen) (do not unscrew it completely!).
 - Manually unscrew the detector cover by turning it counterclockwise.
- Clean the cover using a stream of compressed air directed from the inside.

If the above procedure does not significantly improve permeability, the cover should be replaced with a **NEW** one, supplied **ONLY** by the Manufacturer!!!

In cases of contamination with oil or lacquers, the cylindrical cover should be replaced with a new one.

6.2.2. SENSOR MODULE REPLACEMENT

WARNING! The procedure for removal of the detector's cylindrical cover must be carried out with the utmost care to avoid damaging the gas sensor or the threads on the body or cover.
DO NOT power up the system in the absence of this cover.

6.2.3. Procedure for removing the sensor module for calibration:

- a) Remove the detector cover as described in 6.2.1.
- b) Unscrew the screw securing the sensor module to the spacer sleeve (if the screw is stuck, hold the sleeve with narrow pliers).
- c) Grasp the edges of the insulating board and disconnect the sensor module along with the white filler cap from the connection socket (if the filler cap is removed first during the sensor board disassembly, DO NOT pull or touch the gas sensor!!!).
- d) Place the sensor board and the white filler cap in a sealed polyethylene bag or container and seal it tightly.
- e) A sudden mechanical shock (e.g., dropping onto a hard surface) can permanently damage the gas sensor!
- f) Place the module in a box protected against shocks.
- g) Reinstall the detector cover, lightly tightening it by hand until resistance is felt (excessive force may damage the anti-corrosion layer on the threaded surfaces!).
- h) Tighten the screw securing the cover to the body.
- i) Do NOT power on the detector until the sensor module is installed.

6.2.4. Procedure for installing the sensor module (with the power off!):

- j) Remove the sensor cover.
- k) **WARNING!** For MS-nK/N models, a sudden mechanical shock (e.g., dropping onto a hard surface) can permanently damage the gas sensor or, as often happens, alter the sensor's calibration settings, necessitating recalibration!
- l) Ensure that the white filler cap is correctly seated on the gas sensor board (the securing screw is in the hole on the sensor board and the cap is flush with the surface of the board).
- m) Grasp the edges of the sensor module board and gently connect the module to the connection socket, ensuring all connections enter the socket (DO NOT touch the gas sensor!!!).
- n) Screw the sensor board with the filler cap into the spacer sleeve (do not apply excessive force!).
- o) Reinstall the detector cover, lightly tightening it by hand until resistance is felt.
- p) Tighten the screw securing the cover to the body.

After installing the cylindrical cover, replace the grey or yellow calibration label with a new one (provided with the new sensor module).



NOTE: for periodic calibration, check or complaint regarding the sensor – DO NOT remove and return the entire detector to the Manufacturer and ONLY THE SENSOR MODULE !!!

6.3. Spare parts available for the DEX detector:

- a) sensor module (with calibration of 2 thresholds for a specific medium);
- b) sensor shield with porous sinter made of bronze or stainless steel;
- c) a set of service keys and locks (hex key, cover 'U' key/handle for the cover, cover locking screw, sensor shield locking screw);
- d) simple mounting bracket made of stainless steel + 2 screws for securing to the detector body;
- e) 5mm copper ring terminal for crimping the core connected to the equipotential bonding point in the explosion hazard zone.

6.4. STORAGE OF DEX®



DEX/F detectors should be stored in a place free from vibrations, moisture, dust, exhaust fumes, free of any chemically active substances (especially those containing silicones and derivatives), in a tightly sealed polythene bag.

Long-term storage temperature: from -20°C to +50°C (exception: DEX-nE/N models with an electrochemical sensor – from -20°C to +25°C).

DEX® should always be stored with the attached short calibration certificate.

After exceeding the storage period (calculated from the date of manufacture or issue from the manufacturer's warehouse):

- 6 months – for detectors with an electrochemical sensor;
- 12 months – for detectors with a catalytic sensor;
- 36 months – for detectors with a semiconductor or Infra Red optical sensor;

recalibration is recommended.

6.5. PLEASE NOTE:

Due to the continuous improvement of our products and our desire to provide the most complete, detailed information possible on them and to provide the know-how necessary for the correct, long-term operation of our products based on our customers' experiences to date, GAZEX reserves the right to make minor changes to the technical specifications of the products supplied, while such changes and not included in this User Manual, and to modify the latter. For this reason, please verify and confirm with the Manufacturer that your User Manual is up to date (please state the exact type/version and model of the device in use and the manual edition number – from the footer of the document).

6.6. NOTE:

THE FREQUENCY OF PERIODIC INSPECTIONS of the gas detection system with MD... modules should be determined by the operating conditions, the type of detectors used, and the importance of the system/facility in the opinion of the User:

1)

it is recommended to conduct a **PERIODIC INSPECTION OF THE SYSTEM after every replacement of a sensor module or calibration of any detector** in the system (the frequency depends on the calibration period recommended in the technical parameters of the respective detector models).

2) Additionally:

A. **Recommended** frequency of periodic SYSTEM inspections **every 3 months**:

- for systems with detectors operating in heavily dusty, humid environments, where gas background is frequently present, and
- for extensive systems containing a significant number of detectors.

B. **Normal** frequency of periodic SYSTEM inspections **every 6 months**:

- for systems with detectors operating in generally stable conditions, without exposure to a constant gas background, and
- for systems controlling gas valves.

C. **Reduced** frequency of periodic SYSTEM inspections **every 12 months**:

- for systems with detectors operating in normally clean atmospheres and stable conditions, and
- for systems containing a small number of detectors/devices.

A Periodic System Inspection should also be conducted EVERY TIME after the occurrence of particular conditions in the detection system operation, such as:

- periodic extreme operating conditions for detectors, e.g., high gas concentrations (over 50% LEL or more than 75% of the temporarily permissible concentration range or measurement range), extremely high or very low temperatures (close to the recommended operating temperature limits), high periodic dust levels, or sustained humidity increase (at the condensation threshold);
- presence of high concentrations of gases other than the calibration gas, which were not anticipated in the monitored zone;
- extended operation in the A2 alarm status;
- after a power outage of more than approx. 3 days (excluding DEX-nKL/N models);
- after voltage surges or strong disturbances in the electrical installation;
- after maintenance or installation work that could affect the system's operation or configuration (e.g., painting; floor maintenance; changes in the number, placement, or power supply of system devices, etc.).



PLEASE NOTE: The above-mentioned frequency of System inspections can be considered to be in line with good engineering practice, based on over 30 years of experience of the Manufacturer. However, it should be emphasised that in the specific conditions of a given Customer, this frequency **may be subject to modification**, based on the principle that the more important the system is (for the Customer/User), i.e., the more the Customer cares about efficient, failure-free operation of the facility where the system is used, the more frequently the system should be inspected. When expecting to increase the level of operational safety of their facility, the Customer should inspect the detection system more frequently, e.g. every 4 weeks or prior to each important event/measurement. On the other hand, where the role of the detection system is considered to be less important or based on the Customer's own assessment of the reliability of the facility's components, the Customer/User may decide to extend the inspection period e.g. to 6 or 12 months.

THE SYSTEM INSPECTION INTERVAL MUST NOT EXCEED 12 MONTHS!

7. WARRANTY TERMS AND CONDITIONS

The device is covered by the Gazex Standard Warranty 3 years plus (SGG3Y+) in Poland according to the terms and conditions of SGG3Y+ available at www.gazex.pl. Selected extracts from the SGG3Y+ terms and conditions:

1. GAZEX guarantees the efficient operation of devices of its own manufacture for the period up to the end of the year in which the device was manufactured and for another three years.
- 1.1. The year of manufacture is determined on the basis of the device's nameplate (*warranty cards are not issued!*).
 - 1.2. If the nameplate is illegible – the year of manufacture will be determined on the basis of the serial number or the code labels on the components (*if any*) together with the records in the GAZEX electronic manufacturing surveillance system. Such verification is subject to a charge. The fee is PLN 50.00 net for each started verification of a batch of up to 10 devices.
 - 1.3. Non-identifiable devices, i.e. with a damaged/illegible nameplate or no nameplate at all and with the GAZEX logo removed/covered permanently, shall not be subject to the warranty.
 - 1.4. The SGG3Y+ warranty covers all devices manufactured by GAZEX after 1 January 2021 which display the year of manufacture '2021' or later on the nameplate.

4. The warranty does not cover damage caused by:
- a) mechanical shock, vibration and effects, thermal effects and chemical effects;
 - b) damages resulting from improper storage, faulty installation or improper operating conditions contrary to the device's User Manual;
 - c) failure to carry out periodic maintenance or by other negligence;
 - d) deliberate action by the user, third parties or persons not authorised to carry out repairs;
 - e) lightning, power line surges, or electrostatic charges;
 - f) force majeure or other events beyond the Manufacturer's control.

Consumables including, but not limited to, fuses, batteries, built-in batteries, gas sensors (which are covered by the GAZEX OGG+ Limited Warranty), porous sintered components are not covered by the warranty.

6. The warranty rights cease to apply in the following cases:
- a) damage to the factory seals, service seals or identification marks on the device/components;
 - b) interference with the device's internal systems or making any other changes to the device or control software or when the device is operated with non-original components not supplied by GAZEX;
 - c) failure to carry out periodic maintenance activities, confirmed by systematic entries in the Periodic Inspection Record (enclosed with the device or devices cooperating with it) and indicated as necessary in the device's User Manual.

The full terms and conditions of SGG3Y+ are available at www.gazex.pl.

FAILURE TO COMPLY with all the terms and conditions of installation and operation of the detector as described in this manual (which shall include keeping the Periodic Inspection Record) will result in the loss of warranty rights.

An extended version of the Periodic Inspection Record is available in .pdf format at: www.gazex.pl.

There is a possibility to extend the warranty to 5 years – Gazex Extended Warranty 5 year plus (RGG5Y+), according to the terms and conditions of RGG5Y+ available at www.gazex.pl.

MS sensor modules in DEX/F detectors are covered by the GAZEX Limited Warranty plus (OGG+) for a period of:

- **3 months** from the date of purchase on the invoice, but not more than **6 months** from the date of manufacture/packaging (MS equipped with electrochemical sensors);

- **12 months** from the date of purchase on the invoice, but not more than **18 months** from the date of manufacture/packaging (MS equipped with semiconductor, catalytic or Infra Red optical sensors)

If the date of sale cannot be determined or verified, the warranty period is assumed to start from the packaging/shipping date or calibration date on the Short Calibration Certificate in accordance with the OGG+ terms and conditions available at www.gazex.pl.

PLEASE NOTE:

Any complaints require that a warranty repair request or post-warranty repair request is registered on: <https://www.gazex.com/pl/serwis>

PLEASE NOTE:



The DEX[®] detector is marked with a special, NON-REMOVABLE nameplate, resistant to chemical agents and capable of withstanding a very wide range of temperatures. **However, it must be protected from mechanical damage!**



It is FORBIDDEN to remove or cover the nameplate, the Manufacturer's identification marks, original symbols, and informational labels, or to attach other labels or markings to the detector's enclosure. Any inventory or informational labels from the User should be placed next to the installed detector, on the mounting bracket, or hung on the connecting cable.

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MAINTENANCE SCHEDULE for DEX/F Detector – Recommended for Normal Operating Conditions

v2406

ACTIVITY	OPERATIONAL CHECK	GAS SENSOR CALIBRATION	INSPECTION AND MAINTENANCE OF THREADED CONNECTIONS	INSPECTION OF SENSOR COVER PERMEABILITY	INSPECTION OF DETECTOR BODY SEALING
APPLICABLE TO	Detector	Sensor module MS	Threads on detector cover and sensor shield, locking screw threads	Sensor shield with porous sinter (stainless steel or bronze)	Cable gland and detector cover
BASIC TOOLS REQUIRED FOR MAINTENANCE	x	1.5 mm hex key (Allen) <i>(provided with DEX)</i> ; Phillips screwdriver (PH1), flathead screwdriver, GTS-DEX set <i>(for MS replacement)</i>	'U' handle and 1.5 mm hex key (Allen) <i>(provided with DEX)</i> ; clean cotton cloth	1.5mm hex key (Allen) <i>(provided with DEX)</i> , can of compressed air	Adjustable wrench (minimum adjustment range 24-26mm); 'U' handle and 1.5mm hex key (Allen) <i>(provided with DEX)</i>
SPECIALISED TOOLS/MATERIALS REQUIRED FOR MAINTENANCE	Test cap TC-DEX <i>(supplier: GAZEX)</i> , test gas cylinder with regulator and flow meter <i>(GTS-DEX set)</i>	NEW or recalibrated sensor module OR calibration set CS <i>(available only from Manufacturer or Authorised Service Centre)</i>	x	For possible replacement: new sensor shield with porous sinter (stainless steel or bronze, <i>supplier: GAZEX</i>)	For possible replacement: gasket for detector cover <i>(supplier: GAZEX)</i>
CONSUMABLE MATERIALS FOR MAINTENANCE	Test gas	Test gas <i>(for MS replacement)</i> or calibration gas <i>(for CS)</i>	Technical petroleum jelly	Compressed air	x
RECOMMENDED INTERVAL <i>(not exceeding)</i>	3 or 6 months OR Each time after presumed exposure to high gas concentrations OR Each time after at least 3 days of power interruption <i>(not applicable to DEX-nKL/N and DEX-nR/N)</i>	36 or 12 or 6 months <i>(as per Tables 1.1...)</i> OR 3 months in the presence of gas background OR Each time after exposure to extremely high gas concentrations	12 months	12 months OR 3 months in dusty environments or in the presence of oily vapours in the monitored room OR Each time there is a negative operational check result	12 months OR 3 months in a humidified monitored room

This table is a synthetic summary of the recommendations in this User Manual. Details of selected operations are described in the Manual.