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**Installation, Operation, and
Maintenance of Toxic
Gas-Detection Instruments**

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Contents

1	Scope	11
2	References	12
3	Terms and definitions	12
4	Basic information on the properties, behavior, and detection of gases and vapors	16
4.1	Detecting gases and vapors – General	17
4.2	Some common properties of gases and vapors	18
4.3	The differences between detecting gases and vapors.....	19
4.4	Oxygen deficiency	23
5	Measuring principles	25
5.1	General.....	25
5.2	Selection criteria.....	26
5.3	Miscellaneous factors affecting selection of equipment	30
6	Behavior of gas releases	30
6.1	Nature of a release.....	30
6.2	Buildings and enclosures.....	33
6.3	Unventilated buildings and enclosures.....	33
6.4	Ventilated buildings and enclosures	34
6.5	Natural ventilation.....	34
7	Design and installation of fixed gas detection systems	35
7.1	Basic considerations for the installation of fixed systems	35
7.2	Location of detection points.....	36
7.3	Access for calibration and maintenance	40
7.4	Additional considerations for sample lines.....	40
7.5	Summary of considerations for the location of sensors or sampling points.....	41
7.6	Installation of sensors.....	42
7.7	Integrity and safety of fixed systems.....	42
7.8	Timing of installation during construction operations	44
7.9	Commissioning	44
7.10	Operating instructions, plans and records.....	45
8	Use of portable and transportable toxic gas detection equipment.....	46
8.1	General.....	46
8.2	Initial and periodic check procedures for portable and transportable instrumentation	47
8.3	Guidance on the use of portable and transportable equipment.....	50
9	Training of operational personnel.....	52
9.1	General.....	52
9.2	General training – Basic limitations and safety.....	53
9.3	Operator training	54
9.4	Maintenance training	54
10	Maintenance, routine procedures and general administrative control.....	55

10.1 General.....	55
10.2 Operational checks	56
10.3 Maintenance	58
10.4 Sensors	59
10.5 Flow systems.....	60
10.6 Readout devices	60
10.7 Alarms	61
10.8 Workshop calibration test and equipment	61
Annex A – Applicability & acceptance criteria (normative)	65
Annex B – Environmental parameters (informative)	67
Annex C – Instrument maintenance record for toxic gas detectors (typical) (informative)	71

INTRODUCTION

Toxic gas detection equipment may be used whenever there is the possibility of a hazard to life or property caused by the accumulation of a toxic gas-air mixture. Such equipment can provide a means of reducing the hazard by detecting the presence of a toxic gas and issuing suitable audible or visual warnings. Gas detectors may also be used to initiate precautionary steps (for example plant shutdown, evacuation, and operation of fire extinguishing procedures).

Equipment may be used to monitor a gas atmosphere below the applicable level, (PEL, REL, TWA, STEL or IDLH), limit in circumstances where accumulation of toxic gas may result in a concentration of the gas/air mixture to potential risks to life and health. Performance requirements for gas detecting equipment for such purposes are set out in ANSI/ISA-92.00.01 and ISA-92.00.04. However performance capability alone cannot ensure that the use of such equipment will properly safeguard life or property where toxic gases may be present. The level of safety obtained depends heavily upon correct selection, installation, calibration and periodic maintenance of the equipment, combined with knowledge of the limitations of the detection technique required. This cannot be achieved without responsible informed management.

Portable equipment covered by the ANSI/ISA-92.00.01 and ISA-92.00.04 commonly have additional detectors for combustible gases and also for oxygen deficiency. Users are cautioned that even mild oxygen deficiency may be due to toxic concentrations of some other gas or vapor, which may not be detectable or adequately detected by the equipment in use. This concept must not be relied upon for detection of a non-monitored toxic gas because 0.1% oxygen reduction can mean 1,000 ppm or greater of the unknown toxic gas, which usually exceeds most toxic gas safety limits. All toxic gases suspected should be monitored by the proper equipment.

Minimum requirements for the instruction manual of any particular toxic gas detection equipment are specified in ANSI/ISA-92.00.01 and ISA-92.00.04. These standards provide some necessary background knowledge on the points mentioned above.

This standard has been specifically written to cover all the functions necessary from the need for gas detection all the way through ongoing maintenance of a successful gas detection operation. Different clauses are appropriate for different tasks within this range of operations. Each clause has been written as stand-alone as far as practicable. This means that some information is repeated in different clauses but with a different emphasis.

The following table gives a broad suggestion as to the most relevant clauses to the typical tasks to be performed.

	Definitions	Basic information properties of gas and vapors	Measuring principles	Selection of equipment	Behavior of gas releases	Design and installation of fixed gas detection systems	Use of portable and transportable toxic gas detection equipment	Training of operational personnel	Maintenance, routines-procedures, and general administrative control	Measuring principles (full detail) (normative)	Environmental parameters (informative)
Function (Clause)	3	4	5	6	7	8	9	10	11	Annex A	Annex B
Authorities	+	+++	+++	+	+	-	-	-	+	-	-
General management	+	+++	+++	+	+	-	-	+	+	-	+
Selection	+++	+++	+	+++	+++	+	++	-	+	+++	+++
Design engineering / management	+++	+++	+	+++	+++	+++	-	-	-	+++	+++
Installation engineering / management	+++	+++	+	++	+++	+++	-	-	-	+++	+++
Installation, technical	++	+++	++	++	++	++	-	-	-	+	++
Commissioning	+++	+++	++	+	++	+++	-	++	+	-	-
Operations management	++	+++	++	+	+	++	++	+++	+++	+	+++
Operation training	+++	+++	+	+	+	+++	+++	+++	+++	+++	+++
Servicing / Calibration	+++	+++	-	-	-	++	++	+	+++	++	++
Repair	++	+++	++	-	-	+	+	+	+++	++	-
“+++” Essential “++” Advisable “+” Useful “-“ Not applicable NOTE It should be noted that Clause 5 is a simplified version of Annex A.											

Table 1 – Functional applicability

This standard makes recommendations how to establish maintenance and calibration intervals. In certain countries there are general or industry-specific regulations that are mandatory and those shall be followed as a minimum requirement.

1 Scope

This standard gives guidance on, and recommended practice for, the selection, installation, use and maintenance of electrically operated equipment intended for use in industrial and commercial safety applications for the detection and measurement of toxic gases complying with the requirements of ANSI/ISA-92.00.01 and ISA-92.00.04.

This standard is a compilation of practical knowledge to assist the user, and applies to equipment, instruments and systems that indicate the presence of a toxic mixture of gas or vapor with air by using an electrical signal from a gas sensor to produce a meter reading, to activate a visual or audible pre-set alarm or other device, or any combination of these.

Such equipment may be used as a means of reducing the risk whenever there is the possibility of a risk to life or health specifically due to the accumulation of a toxic gas-air mixture, by providing such warnings. It may also be used to initiate specific safety precautions (e.g. plant shutdown, evacuation, ventilation).

This can be applied to all new permanent installations and, where reasonably practicable, to existing permanent installations. It is also applicable to temporary installations, whether new or existing.

Similarly it is applicable to the safe use of portable or transportable equipment, irrespective of the age or complexity of such equipment. Since much modern equipment of this type also includes other types of gas detection, some additional guidance is given for these topics.

NOTE Equipment intended for use in hazardous (classified) areas should be Listed or Labeled for use within the intended area. For fixed equipment, installation should be in accordance with the National Electrical Code, ANSI/NFPA 70.

For the purposes of this standard, except where specifically stated otherwise, toxic gases shall include toxic vapors.

For the purposes of this standard, equipment includes

- a) fixed equipment;
- b) transportable equipment, and
- c) portable equipment.

This standard is not intended to cover, but may provide useful information, for the following:

- a) equipment of laboratory or scientific type intended only for analysis or measurement purposes;
- b) equipment intended for underground mining applications (group I equipment);
- c) equipment intended only for process control applications;
- d) equipment intended for applications in explosives processing and manufacture;