

## Service efficiency when using portable gas detectors

Nowadays, portable gas detection instruments are an integral part of safety programmes in industry, supply and disposal companies, telecommunications and during the transport of hazardous goods (e.g. in the shipping industry). It makes no difference how the instruments are used – whether for all-clear measurements before personnel enter confined spaces, as a personal measurement instrument, to detect leaks or for area monitoring, a reliable warning must be given of any potential hazard, as lives may well be at stake!

Any reputable manufacturer of portable gas detection instruments, and of course all the world's leading occupational safety and health organizations, are fully aware of their responsibility in this context, and insist on all detection instruments being subjected to a function check before they are deployed in safety-relevant applications. What is more, when it comes to performing maintenance of the detection equipment, manufacturers recommend very different adjustment intervals for the sensors to ensure safe operation of the instruments. In addition,

an annual inspection of all the detection instruments is generally required (Table 1).

Unfortunately, there is still a fundamental lack of understanding in some areas of the need for maintenance, and especially of the need for function checks prior to safety-relevant applications. So just why are these tests so important?

Table 1: Definition of terms relating to "maintenance of mobile gas detection equipment"

MAINTENANCE WORK	WHAT IS TESTED?	WHO PERFORMS THE TEST?	INTERVAL
Level 1: daily function test (bump test)	Sensor response Alarm functions Pump function test (only during operation with a pump)	Operator or equipment service personnel	Prior to safety-relevant applications
Level 2: Adjustment of sensors	Adjustment of sensors Alarm functions	Device manufacturer, trained equipment service personnel	Intervals of between 1 and 12 months, depending on sensor type
Level 3: Annual inspection	All function tests and adjustments as described above, plus a test of the explosion-proof elements of a detection instrument (housing, electronics, label, battery); alarm functionality, battery quality, pump quality, replacement of consumable parts (e.g. dust filter, sensor pre-filter ...)	Device manufacturer in some cases trained equipment service personnel	The occupational safety and health organizations require an annual inspection



Dräger Bump Test station

Examples of errors which can only be detected if a test with gas is performed:

- Gas cannot enter the sensor because of a blockage or soiling: => result: no display or displayed concentrations too low
- Torn off pellistors of catalytic Ex sensors following extreme effects of shock => result: display shows zero even when exposed to gas => no warning
- Contaminated pellistors in the catalytic Ex sensors as a result of poisoning (e.g. caused by silicon) => result: insufficient sensitivity
- Electrolyte leaked out of electrochemical sensors => result: no display or displayed concentrations too low
- All sensors show a standard drift in sensitivity over time (corrosion of electrodes etc.) => result: no display or displayed concentrations too low

#### Solutions for various maintenance processes

This shows quite clearly that the described maintenance procedures are indispensable to ensuring reliable and safe work pro-

cesses! What is more, observing these procedures is also a prerequisite for insurance claims if accident or injury does occur.

What needs to be taken into account when designing the maintenance solutions?

- 1) The costs of maintaining portable gas detection instruments need to be taken into account when making the original purchase. The costs of test gas and the work time of personnel are not insignificant – workstations designed especially to support the needs of the described maintenance procedures can help save money.
- 2) In practice, the different service levels for maintaining portable gas detectors are conducted by different employees, and the required standards they need to achieve in their work can likewise vary considerably.

A function test prior to safety-relevant applications is often performed on site by users themselves. Because the duties of the equipment operators generally bear no relation to the measurement technology itself,

they have to be able to operate the equipment safely and reliably. The function test must be extremely simple and quick to perform. Test stations which do not first have to be connected to a PC or the mains power supply are ideal, and the modular Dräger Bump Test Station is perfectly suited to this type of testing. This inexpensive station functions without a PC and does not require any mains power supply. In fact, to some extent the stations even work automatically, which is the advantage most valued by many operators! Some instruments can simply be inserted into the stations, with an OK message flashing on the display to indicate that the function test has been successfully passed, in some cases in just 10 seconds. The advantage of this extremely fast test is obvious – the very low level of gas consumption and the short test duration means total cost control. The Dräger Pac 7000 and Dräger X-am 2000 gas detectors additionally allow the bump test mode to be configured so that

Table 2: typical adjustment intervals for different types of sensor

SENSOR TYPE	TYPICAL ADJUSTMENT INTERVALS	COMMENT
Catalytic Ex sensors	3 to 6 months	
Infrared sensors	6 to 12 months	
Electrochemical sensors	6 to 24 months	Some single-gas detectors with O <sub>2</sub> , CO or H <sub>2</sub> S sensors require no adjustment.
PID sensors	1 day to 30 days	

the instruments are automatically adjusted if they fail the function test. In this case, the instrument display then reads "CAL OK" instead of the usual "OK".

Normally, the results of the function tests are stored in the data logger of the instruments. Some instruments offer the option of connecting a printer for additional documentation of the function test. The local bump test modules can also be interlinked so that the results stored in the printer can be viewed and analysed on a central unit.

The question of how often a portable detector requires adjustment is something that worries many users. Because the answer to this question influences the actual costs of ownership and the availability of operational equipment, this is perfectly understandable (Table 2).

Added to the requirements for the sensors are the regulations imposed by the occupational safety and health organizations. The BG Chemie in Germany, for instance, specifies an adjustment interval of no more than four months for detection instruments with catalytic Ex sensors.

Another question is frequently raised in this context: "If the instruments do require testing prior to safety-relevant applications, do they then still need to be regularly adjusted?". To answer this question, let us first take a look at two different ways to perform the response test.

**1 A1 response test:**

The A1 alarm threshold of the measuring instrument is exceeded when exposed to a test gas concentration above A1

**2 Concentration window**

If exposed to a certain test gas concentration, the expected value is reached within a certain tolerance range.

If a concentration window as per option 2 above is targeted during a function test performed prior to safety-relevant applications, there is no need for a fixed adjustment interval because any incorrect adjustment of the instrument will always be detected. The ideal choice are stations like the Dräger E-Cal Station or, for certain types of instrument (see above), the Dräger Bump Test Station. If the concentration window is not achieved, an adjustment of the sensors is performed automatically.

The computer-assisted Dräger E-Cal Station is the perfect solution for technicians. This modular station can be operated with

Dräger E-Cal station



Analysing the data logger





### Inspection and repair by DrägerService

modules for almost all portable Dräger Safety detection instruments, and one station can contain ten different instrument modules. Two, six or even twelve different test gases can be connected to the master station, and different tasks which have been defined in advance will be worked through automatically by the station at the push of a button. As well as performing function tests and adjustments, it is possible, among other things, to download the stored measured values, configure the instruments and receive plain text support in the event of an error. At the end, a calibration certificate can be compiled.

What is more, the Dräger E-Cal Station offers the option of equipment and data management with all the associated search and analysis functions, while the new "database module" offers a shared database which can be used by several different stations.

#### Level 3: annual inspection

Professional associations, and indeed usually the manufacturers of mobile gas detec-

tion instruments, demand an annual inspection of the measurement equipment to ensure its complete functionality. During the course of this annual inspection, instruments which are used in explosion hazard areas are checked with respect to all their Ex features. Following an adjustment of the sensors, the battery or rechargeable battery function, alarm function and, if applicable, the pump function are also tested. If applicable, worn parts such as dust filters, sensor pre-filters for the elimination of cross-sensitivities, and rechargeable batteries are replaced to ensure continued operation and functionality.

#### Conclusion

If there is inadequate servicing of portable gas detection instruments which play a key role in many company safety programmes, the equipment which is supposed to protect personnel can be rendered useless and, in the event of accident or injury, may result in high claims for damages. When trying to decide how much service is needed for the gas detection equipment in use, it is of paramount importance to use efficient accessory concepts and/or customer-specific service solutions to support the functionality of the measurement instruments. This results in valuable time-savings, reducing logistics and service costs. Dräger Safety sees itself as a partner in all safety-related matters, offering a wide portfolio of products to support all service requirements.

Many of these tasks can be performed by trained technicians. The Dräger Safety Academy runs seminars to teach how to maintain and service the individual devices. In addition, Dräger Service is available as a professional partner worldwide, either in its own right or in the form of service centres. Besides straightforward maintenance, there are options involving complete, customer-specific service programmes – tailor-made solutions, so to speak.

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