



Regular testing of mobile gas detectors to increase employees and plant safety

They may be small enough to hold in your hand, but they are hugely important for the safety of chemical industrial plants and production facilities. Mobile gas detectors are used daily to monitor gas concentrations, sometimes being exposed to extreme conditions in the process. That is why it is all the more important to regularly test the function of these essential devices, in order to ensure the safety of all employees and the entire plant.

Reliable function – even under the harshest conditions

Faced with extreme cold or heat, mechanical strain or dirt, a mobile gas detector has to function reliably under especially demanding conditions. For this reason, the gas detectors used must be regularly serviced in accordance with regulations. A visual inspection alone is not sufficient. Even though a device appears to be in working order, its function may be impaired or it may not even be working at all. For one's own protection, and that of all employees, it is essential to conduct regular bump tests which are sometimes even stipulated in different regulations.



POTENTIAL REASONS FOR MALFUNCTIONS

There are many reasons why an instrument might return incorrect readings, or partially or completely fail. Examples of such reasons include:



Mechanical damage

If the device is dropped from a great height or suffers mechanical damage in some other way, this damage cannot always be seen straight away



Chemical change in sensor sensitivity

Sensor function may be impaired by chemical influences.



The gas does not reach the sensor

Access to the sensor may be blocked for the gas, and this situation cannot generally be detected with the naked eye.



Sensor poisoning

Some sensor technologies are prone to poisoning. The sensor loses its sensitivity as a result. A known example of this is the silicone poisoning of pellistor-type sensors.



Change in electronic components

Electronic components can change over the course of time and impair function. Electronic components can age over long periods of time.



External environmental factors

Especially in environments with extreme climatic conditions, the device or sensor may be impaired by external influences.

Regular function testing is an established principle in national and international regulations



Different regulations and guidelines internationally – whether in Europe or North America – stipulate regular testing of mobile gas detectors. A daily bump test is the fundamental requirement to ensure the proper function of a device. The following overview shows relevant extracts from European and North American guidelines.



European standards

EN 60079-29-2 (2015):

Explosive atmospheres – Part 29-2: Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen

EN 45544-4 (2016):

Workplace atmospheres - Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours – Part 4: Guide for selection, installation, use and maintenance



U.S. Department of Labor Occupational Safety and Health Administration Directorate of Technical Support and Emergency Management Office of Science and Technology Assessment

Safety and Health Information Bulletin SHIB 09-30-2013:

Calibrating and Testing Direct-Reading Portable Gas Monitors



German regulations

BG RCI T 021e:

Gas Detection Equipment for Toxic Gases/Vapours and Oxygen - Use and Operation

BG RCI T 023e:

Gas Detection Equipment for Explosion Protection - Use and Operation

**Extract from selection aid
IEC/EN 60079-29-2**

All portable/transportable gas detection systems should be checked for functionality with a known concentration of flammable gas just prior to use (bump test). Inspection through a bump test, especially when using the gas detector in conjunction with a gas free permit.

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Ideally the user would perform a functional test with a known gas concentration (in addition to a visual inspection and check of the documentation). Alternatively, a (re)calibration can/should be performed. Ideally by the same personnel tasked with device maintenance.

**Extract from selection aid
OSHA - SHIB 05-04-2004**

When to Perform a Bump Test and When to Perform a Full Calibration In the past, there has been some confusion regarding proper calibration procedures and frequency. To clarify this issue, ISEA updated its position statement on instrument calibration in 2010, stating: "A bump test ... or calibration check of portable gas monitors should be conducted before each day's use in accordance with the manufacturer's instructions." If an instrument fails a bump test or a calibration check, the operator should perform a full calibration on it before using it. If the instrument fails the full calibration, the employer should remove it from service. Contact the manufacturer for assistance or service.

**Extract from selection aid
BG RCI T021 & T023**

Function testing:

task for suitable test gases, gas mixtures for testing the display and alarm function. The employer must define a criterion which is used to determine whether the device has passed the test. The response time of the device must be taken into account here. Observe the recommendations in the manufacturer's operating instructions. Note: a simple zeroing test in the ambient air does

not meet the requirements of this function test. Visual inspection and function testing must be performed on each working day or prior to each working shift. Furthermore, bump testing should be performed after exceptional situations (device was dropped) or when there is a risk that the device is damaged (sensor poisoning).

Regulations paint a clear picture

For mobile gas detectors, the different regulations strongly recommend – and sometimes even prescribe – performing the bump test prior to daily use. Only with bump testing a possible damage come to light, which would not be identified from a visual inspection alone. The bump test should be performed regularly prior to entering the working area. This approach meets the current guidelines set out by the regulatory agencies.



An overview of function test solutions

Manual bump test

An easy, cost-effective option for testing the function of a portable gas detector is a manual bump test using a test gas. For this method, only a suitable test gas cylinder, an appropriate pressure reducer and a device-specific calibration adapter are needed.



- Device option: start display test via device menu
- Supply the gas
- Test the alarm elements
- Device indicates test result (see operating instructions)
- The test is logged in the device event logger.

Bump Test Station

The Bump Test Station makes the daily bump test more simple because the test is automatically started when the device is placed in the bump test station. Even the test gas is automatically supplied to the device.



Advantages:

- Mobile use possible (in a workshop, vehicle, etc.)
- Mixed gas cylinder accepted: multiple sensors can be tested simultaneously
- Optional: calibration after a failed bump test
- Bump test documented in the device event log
- The Dräger Bump Test Station does not require electricity

Test station Dräger X-dock®

The Dräger X-dock automatic test and calibration station is the modular solution for the daily bump test which can also be integrated in a workshop and fleet management system. As an individual station it can be operated autonomously without a computer. It can perform the types quick and extended bump tests, as well as perform calibrations, read out the data log and test the alarm elements of the gas detector or the response times of the sensors.



- Easy operation
- Alarm element testing; automatic repair functions
- Minimised test time and gas consumption
- Printer can be connected
- Results stored on the station or on a server (when used in a network)

How the Dräger X-dock® works

Simply place the gas detector to be tested in the dock and close the lid – everything else is done automatically. Thanks to the innovative pneumatic system, tests can be performed extremely quickly. The reduced gas flow means that significantly less gas is consumed, saving money in the process.

1. Place the mobile gas detector in the dock
2. Close the flap
3. Test runs automatically



Green display and green LED on the module indicate that the test was passed.



Red display and red LED indicate a failed test; Detector / measurement channel is set to "Error".

The Dräger X-dock can also be used in a network: different stations in different places can be connected via a network. The data acquired is monitored, processed and administered centrally using the X-dock Manager software.

Regular bump tests increase day-to-day safety at work

Mobile gas detectors are used for continuous measurement. They are an essential companion for everyday use. Testing their function is therefore especially important.

Daily bump testing ensures that the sensors are working without errors and the sensor entry is not blocked by dust or dirt. While this conclusion focuses on the importance of performing a daily bump test, carrying out prescribed calibrations is at least just as important, even if calibrations occur less frequently. Calibration should be performed regularly, because environmental factors or ageing can cause changes to sensor sensitivity. Recommendations for calibration intervals can be found in the technical documentation for the device in question, or in national regulations.

Simple, quick bump tests can uncover potential malfunctions and significantly increase the safety of your employees.

Side note: Quick and extended bump test

The following comparison shows the differences between the two test methods. Dräger generally uses the extended bump test because it offers a greater degree of safety.



Quick bump test

Usually checks whether the first alarm threshold is exceeded. There are variations where pre-alarm A1 is not checked, but rather a defined or calculated threshold. However, the quick bump test only ever has one threshold that must be exceeded and no thresholds that must not be exceeded.

Depending on how it is performed, minimum times for exceeding the threshold and maximum times until the threshold is exceeded can be defined to increase safety.

No substitute gas can be used in this test type. The test is performed with a set test gas.

Extended bump test

The extended bump test generally checks whether a concentration is reached, which must fall within a tolerance range according to the test gas concentration supplied. The test gas concentration must therefore be known to the device or transmitted by the test station.

Times can additionally be defined, e.g. a minimum or maximum time.

A substitute gas can be used. In this test type, the gas detector automatically switches to the test gas selected previously.



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