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Dräger sampling hoses for portable gas detection devices

Applications and test durations

Dräger. Technology for Life®


water

Monitoring confined spaces for toxicity and explosion risks

Working in confined spaces and containers like pipelines, silos, ducts and shafts is part of everyday operations in many industries. But before maintenance, cleaning or repairs can take place inside these spaces, any risks facing the workers must be minimised. In general, a risk assessment will determine which specific risks might occur. Common risks include concentrations of toxic or explosive gases and fumes, as well as life-threatening oxygen depletion.

To prevent accidents and protect workers, these confined spaces and containers must be cleared for entry. That means checking and analysing the concentrations of any hazardous substances that may be present. This is done from outside by using sampling hoses that can be connected to compatible multi-gas detection devices. These hoses enable you to take in gas samples and test them remotely without exposing the testing crew to hazards. The Dräger X-am® 3500 and Dräger X-am® 8000 are particularly well-suited for this type of testing. The Dräger X-am® 2500, Dräger X-am® 5000 and Dräger X-am® 5600 multi-gas detection devices can be used in combination with the Dräger X- am® pump. The Dräger X- zone® 5500 area monitoring device includes an optional built-in pump.

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Transparent float probe with Luer adapter and 3 mm FKM hose

CHOOSING THE RIGHT HOSE

To ensure accurate, reliable testing, the hose must be suitable for use with the testing device. However, there are other important criteria when choosing the right type of hose, especially the test duration and the level of precision required:

- **Volume flow:**
  of the (built-in) pump being used: The volume flow of the Dräger X-am 3500/8000 is 0.35 l/min.
- **Hose length:**
  Dräger offers hose lengths ranging from 1 to 45 m. All hoses are supported by the pump models mentioned above.
- **Hose diameter:**
  Dräger hoses have an inner diameter of 3 or 5 mm.
- **Hose material:**
  Dräger offers hoses which are made out of fluorocarbon rubber (FKM), polyvinyl chloride (PVC), rubber or polytetrafluorethylene (PTFE, available only with 5 mm inner diameter).
- **Gas:**
  Which gas concentrations are being tested?

TIME IS A RELEVANT FACTOR DURING TESTING

Before each test, the sampling hose must be flooded with the air sample to be tested. The flooding phase is intended to eliminate any interfering factors such as “dead volumes”. Flooding times vary depending on the type and concentration of gas or vapour being tested, as well as the material, length, diameter and age of the testing hose. As a rule of thumb, this approach is recommended: With a dry, brand-new hose, allow the hose to be flushed for about 3 seconds per metre.

During the testing phase, The narrower the hose diameter, the faster the results will be available. For a volume flow of 0.3 l/min, a standard gas such as methane, oxygen or carbon monoxide only takes 1 about 5 seconds to pass through a 10 m hose with an inner diameter of 3 mm. Under the same conditions, it takes the same gas as long as 40 seconds to pass through a 10 m hose with an inner diameter of 5 mm – in other words, almost 3 times longer.

The table below shows other testing times for hose lengths of 10 and 45 metres, at three different volume flows and an inner hose diameter of either 3 mm or 5 mm. In all these cases, the 3 mm hose works more than twice as fast as the 5 mm hose.

FLOW-THROUGH TIMES IN PRACTICE

Inner diameter	Hose length	Pump 1 (300 ml/min)	Pump 2 (400 ml/min)	Pump 3 (500 ml/min)
3 mm	10 m	15 s	11 s	9 s
5 mm	10 m	40 s	30 s	24 s
3 mm	45 m	64 s	48 s	39 s
5 mm	45 m	177 s	133 s	106 s

Flow-through times are not the only relevant factor when choosing the right hose type. In practice, sampling hoses with an inner diameter of 3 mm offer other significant advantages over 5 mm hoses:

ADVANTAGES OF SAMPLING WITH 3 MM HOSES

Features	Advantages
Less volume inside the hose 5 mm hose: Circular area = 19.6 mm^2 3 mm hose: Circular area = 8 mm^2 Summary: 59% less cross-section area	Faster gas flow
Less surface inside the hose 5 mm hose: Circumference = 15.7 mm 3 mm hose: Circumference = 10 mm Summary: 36% less circumference	Less surface area for gas adhesion; quicker gas flow
Less material (hose wall) despite similar stability	Hose is approx. one-third lighter
Luer connection included as standard	Easy connection with the gas detection device/ pump via a bayonet connector
Crimp-resistant	Stronger crimp-resistance compared with 5 mm hose

SIMPLIFIED CLEARANCE TESTING WITH DRÄGER X-AM 8000 ASSISTANCE FUNCTION

The Dräger X-am 8000 automatically calculates how long it will take for each sample to flood the hose. However, this requires the use of an FKM hose with an inner diameter of 3 mm. The calculation accounts for the hose length (entered by the user within the assistance function) and the sensor equipment, along with the selected testing gases and temperature limits.

As the hose is being flooded, the user sees a countdown which prevents them from ending the testing process too soon. If a gas alarm is triggered while the countdown is still running, at least one gas has already reached the sensors. If this happens, the process ends automatically. After the countdown has finished without interruption, the user should wait until the values shown in the test results are stable.

To perform its calculations, the device refers to a comprehensive database of values for each type of gas. For standard gases like methane, oxygen, carbon monoxide and hydrogen sulphide, for example, the X-am 8000 uses the following- flow-through times:

– 20 seconds for the gas detection device (e.g. for the distribution of the gas to the sensors) plus
– 2 seconds for each metre of hose

So, for a 10-metre-long hose, the device specifies a wait time of 40 seconds. This time includes a safety buffer in case of any external influences.

For more information about using the assistance function, consult the Dräger X-am 8000 operator's manual. Here is an excerpt:

"The flush time indicated shows the minimum wait time that the testing gas needs under ideal circumstances to travel from the sampling site to the sensor. This applies when using a Dräger sampling hose (fluorocarbon rubber, brand-new, dry, clean) with an inner diameter of 3 mm. Additional attachments (e.g. pre-testing tubes) increase the wait time and must be taken into account as well. The flush time applies only for the pre-set testing gases. The flush times recommended by the gas detection device have been calculated using state-of-the-art technologies. Dräger cannot be held liable for the use of these flush times. The user must always assess the appropriate wait time for their intended measurement activity.

After the wait time, the user must evaluate whether the test value is stable or if the wait time, may have been insufficient. The same applies if the countdown is interrupted unexpectedly. Testing for gases or vapours other than the selected testing gas will result in additional wait time per testing channel which must also be added to the minimum wait time."

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Dräger X-am® 8000

OTHER ASPECTS WHEN SELECTING HOSE DIAMETER

The Dräger X-am 3500 and X-am 8000 devices as well as the X-am pump are optimised for use with sampling hoses with a 3 mm inner diameter. However, these devices can also be used with 5 mm hoses with no problems.

In some cases, a 5 mm hose may be preferable: The Dräger X-am 7000, Dräger X-zone 5500 and Dräger X-am 125 pump are designed for use with 5 mm hoses. However, they can also be used with 3 mm hoses. If the chemical characteristics of the testing gas require the use of a PTFE hose, this is available only in a 5 mm version. Regular calibration of testing devices using calibration tools like the Dräger X-dock can also only be performed using 5 mm hoses.

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Dräger X-am® pump with hose connection

DRÄGER SAMPLING HOSES: THE PORTFOLIO

The following table shows a selection of sampling hoses from the Dräger portfolio. This excludes the wide selection of fixed probes and telescopic probes from Dräger. For information about these,please refer to the technical documents for the devices in question.

Part number	Description	Length	Dräger X-am® 125 Pump	Dräger X-am® Pump	Dräger X-am® 7000	Dräger X-am® 3500/8000	Dräger X-zone® 5500	Dräger X-dock®
83 25 832	**Float probe (10 m), incl. Luer adapter** FKM hose, OD: 6.4/ID: 3.2 mm/WT: 1.6 mm	1,000 cm	X	X		X	X	
83 25 831	**Float probe (3 m), incl. Luer adapter** FKM hose, OD: 6.4/ID: 3.2 mm/WT: 1.6 mm	300 cm	X	X		X	X	
83 18 371	**Float probe with 5 m FKM hose,** 70ShA (ID: 5 mm), dust and water filter/set	500 cm			X			
68 07 097	**Float probe incl. CR-NR-hose** (10 m)	1,000 cm			X			
83 26 980	**3 m PVC hose with inner PTFE hose***, ID: 5 mm/WT: 1.5 mm *for reactive gases	3 m	X	X	X	X	X	X
45 94 679	**15 m PVC hose with inner PTFE hose***, ID: 5 mm/WT: 1.5 mm *for reactive gases	15 m	X	X	X	X	X	(X)
83 25 838	**PVC hose* (transparent)**, ID: 3 mm/WT: 1.5 mm *sold by the metre	max. 100 m	X	X		X	X	
83 20 766	**PVC hose* (transparent)**, E-3603 ID: 5 mm/WT: 1.5 mm *sold by the metre	max. 150 m			X		X	(X)
11 80 681	**Rubber hose for float probe** (electrically conductive, anti-static) inner diameter: 5 mm/WT: 2 mm	Sold by the metre			X			(X)
83 25 839	**Rubber hose for float probe** (electrically conductive, anti-static) inner diameter: 3 mm/WT: 1.5 mm	Sold by the metre	X	X		X	X	

Part number	Description	Length	Dräger X-am® 125 Pump	Dräger X-am® Pump	Dräger X-am® 7000	Dräger X-am® 3500/8000	Dräger X-zone® 5500	Dräger X-dock®
12 03 150	**FKM hose** (solvent resistant) ID: 5 mm/WT: 1.5 mm	Sold by the metre	X		X		X	X
83 25 837	**FKM hose** (solvent resistant) ID: 3 mm/WT: 1.5 mm	Sold by the metre	X	X	X	X	X	
83 25 705/ 83 25 706/ 83 25 707/ 83 28 212	**5 m FKM hose, incl. adapter** **10 m FKM hose, incl. adapter** **20 m FKM hose, incl. adapter** **45 m FKM hose, incl. adapter** ID: 3 mm/WT: 1.5 mm	5 m/10 m/ 20 m/45 m	X	X	X	X	X	
83 28 210/ 83 28 211	**5 m rubber hose, incl. adapter** **20 m rubber hose, incl. adapter** ID: 3 mm/WT: 1.5 mm	5 m/ 20 m	X	X	X	X	X	
83 28 208/ 83 28 209	**5 m PVC hose, incl. adapter** **15 m PVC hose, incl. adapter** Transparent ID: 3 mm/WT: 1.5 mm	5 m/ 15 m	X	X	X	X	X	
83 19 364	**Filter set, incl. Luer adapter, 3 mm / 5 mm**, e.g. for connecting with a telescopic probe		X	X		X	X	(X)
83 27 641	**Luer adapter, 3 mm (2 pcs.)**, for hoses without adapter (sold by the metre)		(X)	X		X	(X)	
83 27 642	**Luer adapter, 5 mm (2 pcs.)**, for hoses without adapter (sold by the metre)		X	(X)		(X)	X	
83 27 654	**Float probe (transparent) with Luer adapter,** Luer adapter (female) ID: 5 mm and 50 mm FKM hose, fits all sampling hoses with adapters	50 mm	(X)	X		X	(X)	

OD = outer diameter ID = inner diameter WT = wall thickness

All products with defined length in the Dräger portfolio have a Luer connector. This standard connector enables the hoses to be easily and securely connected with the external pump or with a gas detection device with built-in pump.

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