



FCS-320-TM Aspirating Smoke Detector

FCS-320-TM | FCS-320-TM-R



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1 General

1.1 Introduction

This operation guide describes the smoke aspiration systems featuring FCS-320-TM series aspirating smoke detectors and the associated aspiration pipe system.

The FCS-320-TM designation in this operation guide refers to all FCS-320-TM (FCS-320-TM, FCS-320-TM-R) versions. Specific references are made to differences between the individual versions.

The "FAS/FCS" designation in the illustrations and graphics also refers to all models in the FCS-320-TM series (FCS-320-TM, FCS-320-TM-R), and also applies to LSN models of aspirating smoke detectors.

1.2 Safety Instructions

The following symbols identify points in this operation guide that require particular attention in order to guarantee smooth operation and prevent damage.

**NOTICE!**

Operational malfunction can be prevented and operational improvements can be achieved by observing these instructions.

**CAUTION!**

This symbol warns against actions and behavior which, if disregarded, could cause property damage.

**WARNING!**

This symbol warns against actions and behavior which, if disregarded, could cause personal injury.

1.3 Warranty

This operation guide is subject to technical modification without prior notice and makes no claim to completeness.

As a rule, our "delivery and installation conditions" apply.

Warranty and liability claims in case of personal injury and property damage cannot be asserted if they are based on one or more of the following causes:

- Insufficient attention to the instructions with respect to planning, installation of the aspirating smoke detector, installation of the pipe system, commissioning and maintenance
- Use of the smoke aspiration system contrary to the regulations
- Insufficient monitoring of wearing parts
- Faulty repairs
- Arbitrary constructional changes to the smoke aspiration system
- Acts of God.

Bosch Sicherheitssysteme GmbH, hereinafter referred to as Bosch, assumes no liability for damage or malfunction arising through failure to comply with this operation guide.

**CAUTION!**

The equipment may only be installed by authorized and qualified personnel!

1.4**Copyright**

The copyright to this operation guide remains with Bosch.

This operation guide is intended exclusively for installation engineers and their employees.

Reprinting this operation guide or extracts thereof is permitted for internal purposes only.

1.5**Disposal**

Unusable electrical and electronic devices or modules must not be disposed of with normal household refuse. They must be disposed of in compliance with the applicable regulations and directives (e.g. WEEE in Europe).

2 Technical Specifications

2.1 Product Description

Aspirating smoke detectors from the FCS-320-TM series are active fire detection devices for providing early smoke and fire detection. They are used for space and equipment protection as well as for monitoring air conditioning units or ducts (provided that the FCS-320-TM is installed outside of these units or ducts). You can also pinpoint the exact location of the fire using the innovative fire source identification operation.

Variants

All FCS-320-TM series aspirating smoke detectors have LED displays for operating mode, malfunction and main alarm, and also offer an infrared diagnostics port. In addition, the FCS-320-TM-R variant offers an optical fire source identification display for up to five zones.

fire source identification

Innovative fire source identification technology allows the exact location of the fire to be pinpointed by monitoring up to five distinct neighboring zones. To enable the emergency response teams to intervene as quickly as possible, the location of the fire can also be identified, for example, by means of strobes that are assigned to the various monitoring ranges.

sensitivity

FCS-320-TM series aspirating smoke detectors have a response sensitivity of 0.5%/m to 2%/m light obscuration.

With the new high-power light source technology, a broad detection spectrum including all standardized fires is achieved (see *Section 3.4 Defining the Response Sensitivity, page 35*).

LOGIC-SENS

The intelligent signal processing LOGIC-SENS distinguishes between deception variables and fire events in order to prevent false alarms.

Reliable airflow monitoring

Analogous to point-type smoke detectors, which are monitored electronically for wire breaks and short-circuits, highly sensitive and dependable airflow monitoring is required for smoke aspiration systems. The airflow sensors used in the FCS-320-TM series reliably detect malfunctions such as pipe breakage or obstruction of the air sampling openings.

The airflow monitoring is temperature-compensated and can be set depending on the air pressure.

Plug-and-play

The plug-and-play function makes the installation and commissioning of the aspirating smoke detectors simple. The housing base is preinstalled on site. By presetting the detection unit for standard applications, the FCS-320-TM series aspirating smoke detectors are ready for operation as soon as they are inserted into the housing base.

Patented air sampling openings

The air sampling openings of the pipe system require clearly defined bore diameters that depend on the planning and design. These precise air sampling openings are created using patented aspiration reducing film sheets, marking tape, and clips, which not only permit easy installation, but also prevent "whistling" noises. Another advantage is the quick and easy detection and checking of the air sampling opening diameters.

Point-type detector projection

The system's aspiration points can be equated with point-type smoke detectors. The monitoring areas can therefore be planned in accordance with the applicable national regulations.

Diagnostics

A system with FAS-ASD-DIAG Diagnostic Software, which enables quick and convenient error containment, is available for maintenance and service. The current and stored (max. 72 hours) unit status is read out to the diagnostic appliance via the unit's infrared port. The data is transmitted from the diagnostic appliance to a laptop via a USB cable.

Selecting the fan voltage

The fan voltage can be increased from 9 V to 12 V for any special planning processes. In addition, the fan voltage can be increased up to 13.5 V in intervals of 1 V via the FAS-ASD-DIAG Diagnostic Software. The increase in the fan voltage causes an increase in the air transport speed and therefore reduces detection time.

Extensive pipe accessories

The extensive range of accessories enables the FCS-320-TM aspirating smoke detectors to be used even in the most difficult conditions. Products from air filters and condensate separators to blowing-out systems increase the service life in extremely dusty, damp and cold environmental conditions.

2.2

Areas of Application

Thanks to their detection principle, FCS-320-TM Aspirating Smoke Detectors provide an extremely versatile fire alarm system.

Principle

Air samples are taken from the monitoring range by a pipe system with defined aspiration borings and then fed to the detection unit.

This is especially well-suited for areas in which point-type detectors cannot be used or can only be used under certain circumstances. These include:

- Areas that are difficult to access, in which point detectors are difficult to install and maintain
- Air-conditioned areas
- Areas that require the earliest detection possible
- Areas with a height greater than that allowed for point detectors
- Areas in which point detectors are not desired for aesthetic reasons
- Areas in which strong electromagnetic fields occur
- Areas that are exposed to high or low temperatures
- Areas with contaminated air that require filter elements
- Areas that must be protected against vandalism.

Space protection

The FCS-320-TM series is suitable for monitoring areas such as

- Those with double floors, false ceilings
- Tunnels, ducts, barely accessible hollow spaces
- Storage, high-rise warehouses, elevator shafts
- Museums, cultural institutions
- Hotel rooms, hospital rooms, offices, prison cells, train compartments

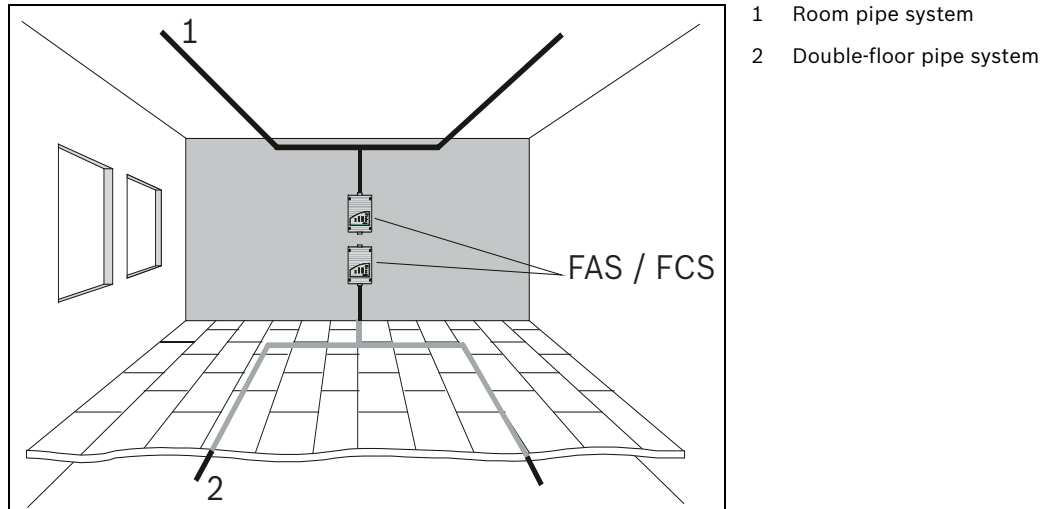


Figure 2.1 Principle of area monitoring with FCS-320-TM series aspirating smoke detectors

Area monitoring with air-conditioning

Area monitoring occurs

- In rooms with air-conditioning for service rooms etc.
- In ventilation ducts
- In double floors, false ceilings
- In IT rooms, e-distributor rooms, transformer cells
- On air-conditioning units (*Figure 2.2*) or
- In the bypass in air-conditioning ducts.

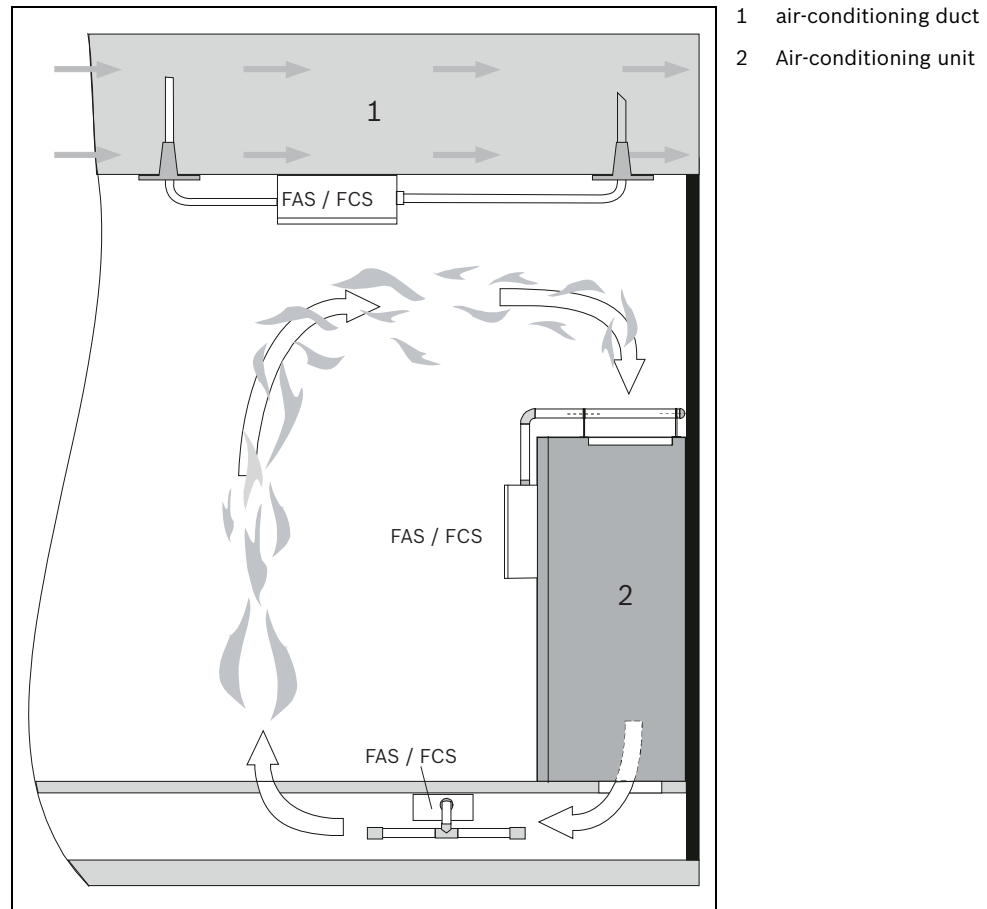


Figure 2.2 Monitoring options for an air-conditioning unit or an air-conditioning duct (depiction of principle)

The FCS-320-TM Aspirating Smoke Detector can be used for early fire detection in areas with special-purpose air conditioning.

Thanks to its high sensitivity, expensive goods and equipment can be monitored reliably. The aspirating smoke detectors from the FCS-320-TM series are therefore especially suitable for areas of application:

- Where early intervention is essential due to a high value concentration
- Where equipment must always be operational
- Where highly sensitive detection is necessary (e.g. in areas where, due to built-in filter elements, the air contains a low concentration of smoke particles)
- Where high air-exchange rates prevail.

Equipment protection

Equipment monitoring involves the direct monitoring of an object. These can be unventilated or force-cooled units or cabinets, e.g.

- Distributor cabinets, switching cabinets
- Telephone-switching equipment
- Measuring, control, and regulation equipment.

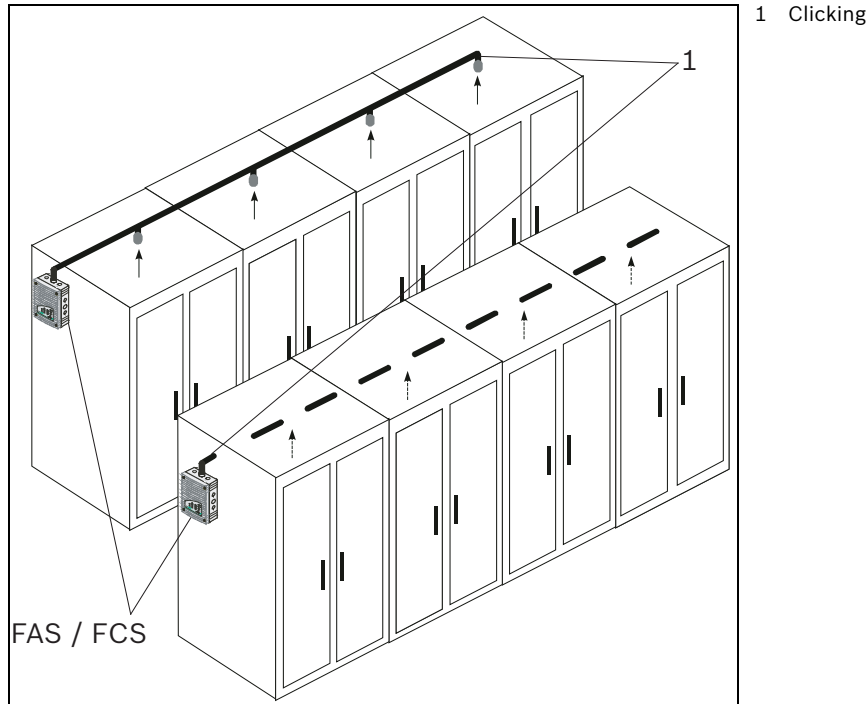


Figure 2.3 Principle of equipment monitoring with FCS-320-TM series aspirating smoke detectors

2.3 System Overview

The Smoke Aspiration Systems comprise a detection unit, housing base and pipe system. The most important components of the Smoke Aspiration System are the sensitive detection unit for detecting smoke aerosols and the aspiration unit with the built-in airflow sensor for transporting the air samples and monitoring the pipe system for breakage and obstructions. The pipe system comprises essentially pipe and fittings. The standard pipe system is made from PVC or ABS. The pipes used for equipment monitoring should be halogen-free. Each air sampling opening in the pipe system represents a point detector in the planning.

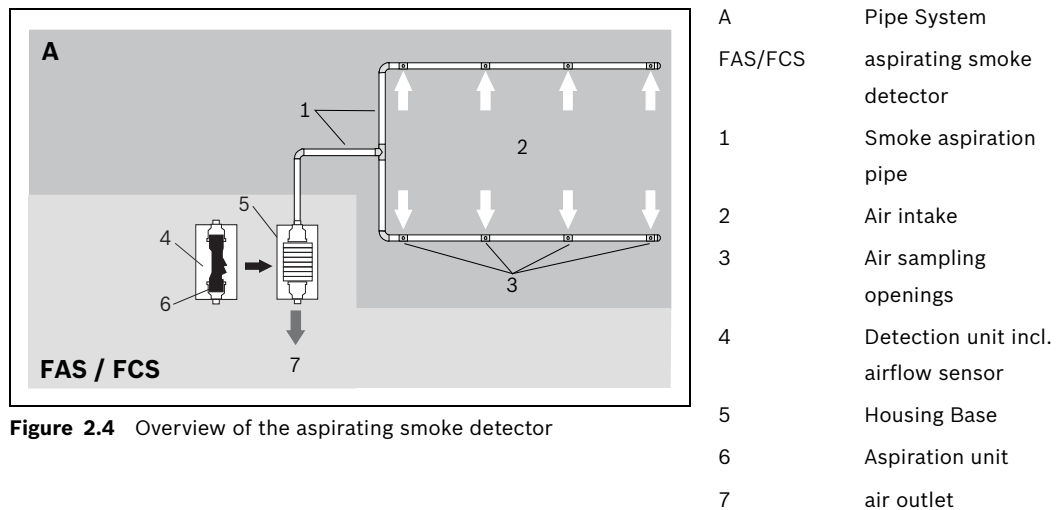


Figure 2.4 Overview of the aspirating smoke detector

To guarantee reliable operation even under the most difficult conditions (clean rooms, recycling area), there are numerous accessories available, such as air filters and water separators; see *Section 2.6 Pipe system components, page 21*.

2.4 Functions

Air samples are taken from the area to be monitored via the aspiration unit. They are fed via a pipe system with defined air sampling openings to the sensitive detection unit (see *Figure 2.4*).

Detection

Depending on the response sensitivity of the detection unit in use and the alarm threshold programmed, the FCS-320-TM aspirating smoke detector triggers the alarm when the corresponding air obscuration threshold is reached. The alarm is displayed via the main alarm LED on the device and transmitted to a connected fire panel.

Various delay times can be set for the alarm thresholds, as well as for displaying and transferring malfunctions. Alarm messages are saved and are reset after the cause has been eliminated.

LOGIC-SENS

The *LOGIC-SENS* intelligent signal processing compares the measured smoke level with known disturbance variables and decides whether something is an alarm or deception. *LOGIC SENS* can be activated or deactivated using the fire panel's programming software.

fire source identification

Fire source identification is possible if an I pipe is planned for a maximum of five areas or devices. The procedure can be divided into four phases (*Figure 2.5* to *Figure 2.8*).

– Phase 1

In its general operating state, the FCS-320-TM-R aspirating smoke detector extracts air samples from the monitoring range and analyzes these for the presence of smoke particles.

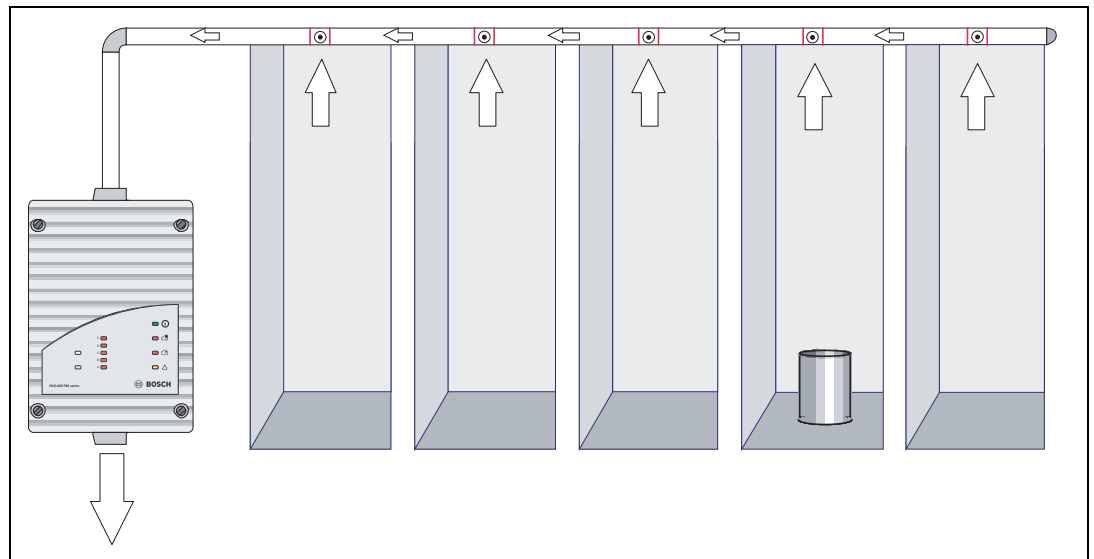


Figure 2.5 Phase 1: Normal operation

– Phase 2

As soon as the system has switched to alarm state as a result of a rise in the concentration of smoke particles typical of a fire, the alarm is signaled.

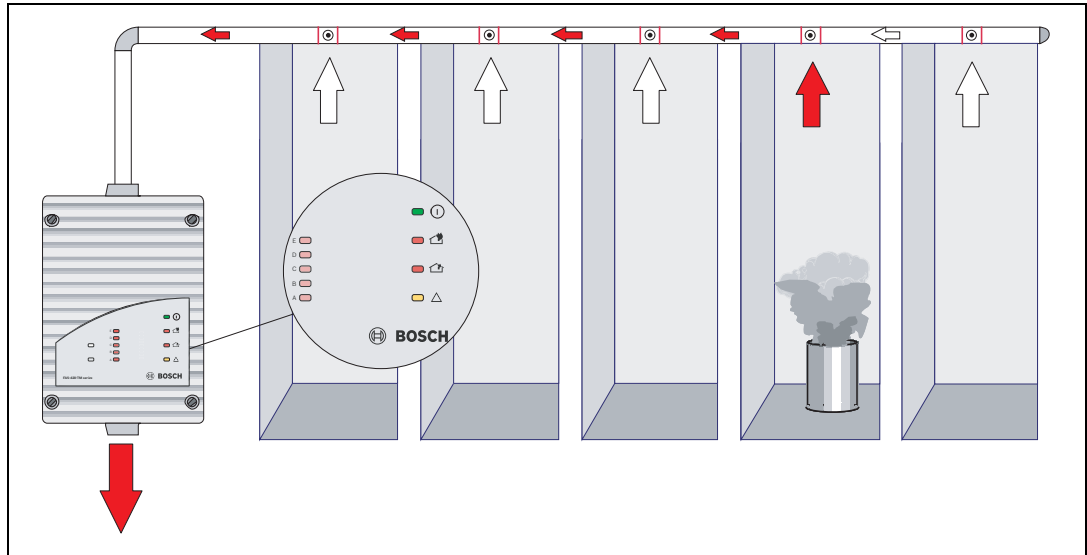


Figure 2.6 Phase 2: Early fire detection

– **Phase 3**

When the alarm is signaled, once the configurable pre-alarm threshold is reached, the aspiration fan switches off and a second fan blows all smoke particles out of the pipe system in the opposite direction.

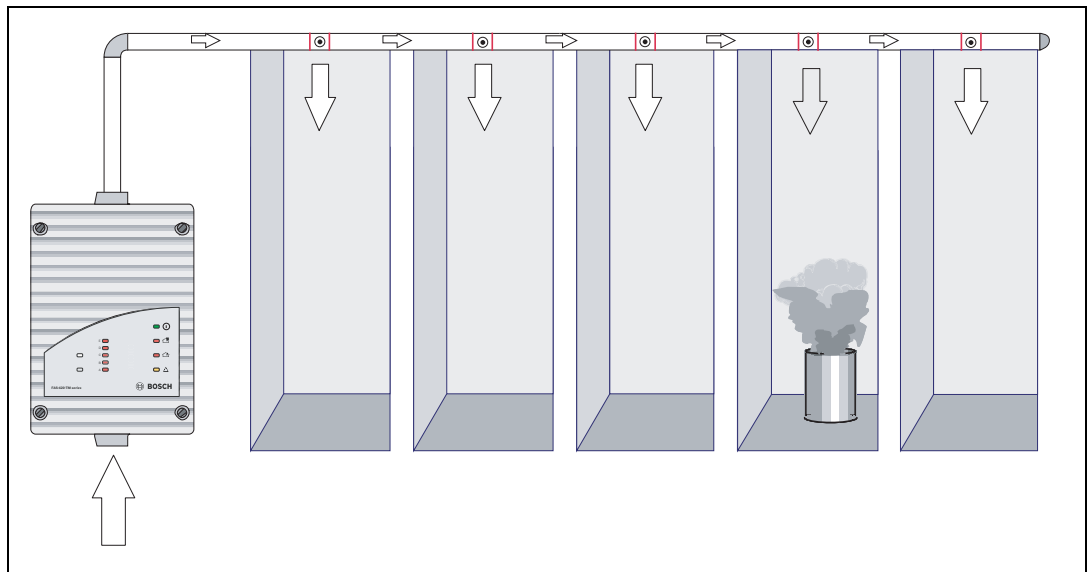


Figure 2.7 Phase 3: Blowing out

– **Phase 4**

Once the pipe system has been blown out, the direction of flow is reversed again and the time required for the smoke particles to penetrate into the detection unit is measured. On the basis of this time, the location of the smoke source can be accurately traced to one of the monitored areas.

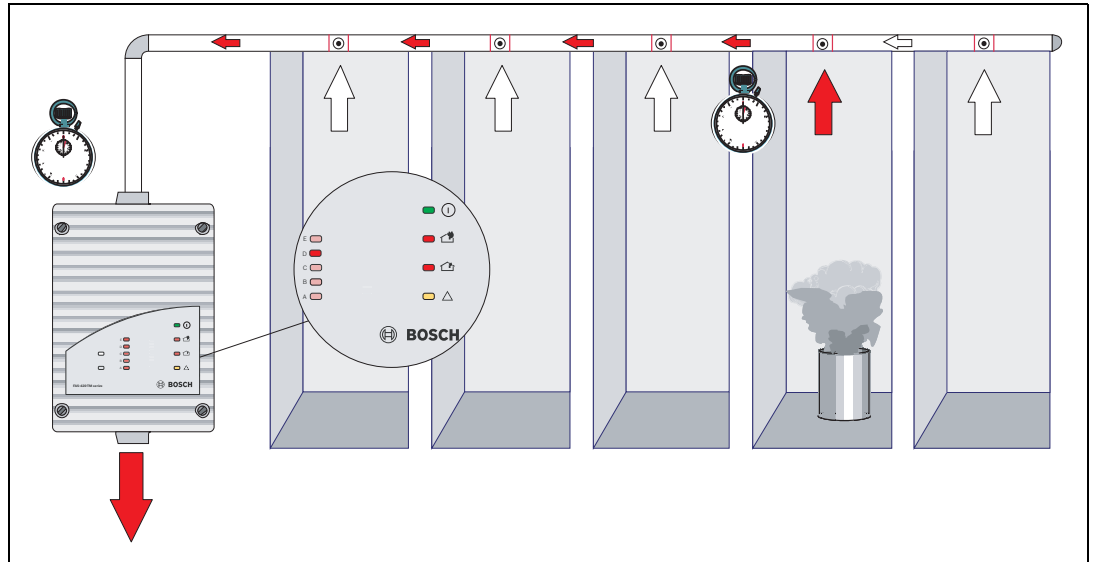


Figure 2.8 Phase 4: Identification of fire source by reversing the fan's direction of flow
Once the fire source has been identified, it is displayed via a corresponding display on the FCS-320-TM-R.

Detection

Depending on the response sensitivity set on the detector module (0.5%/m to 2%/m light obscuration), the FCS-320-TM-R triggers the main alarm when the appropriate light obscuration is reached. The sensitivities can also be set at intervals of 0.1%/m using the FAS-ASD-DIAG diagnostic software. The alarm is displayed via the alarm display on the unit and forwarded to the fire panel connected. The alarm thresholds and the display and transmission of malfunctions can be allocated different delay times. The intelligent LOGIC·SENS signal processing hides misleading values that are similar to those shown in the event of a fire, and ensures a high level of security against deceptive alarms.

Alternative sensitivity

The FAS-ASD-DIAG diagnostic software allows the sensitivity set on the detection unit to be changed if necessary.

Monitoring unit

The detection unit is monitored for contamination and for signal malfunction. A malfunction is displayed on the unit and forwarded to the fire panel. Malfunctions caused by brief environmental fluctuations can be eliminated with a time-delayed setting.

Airflow monitoring

An airflow sensor checks the connected pipe system for breakage and obstruction. The airflow sensor can – depending on the configuration of the pipe system (see *Section 3.2 Principles of Pipe Planning, page 32*) and the setting of the airflow sensors - detect an obstruction of a single air sampling opening. The airflow monitoring is temperature-compensated and can be set depending on the air pressure. On expiry of a defined delay, the malfunction is displayed on the aspirating smoke detector and the message is transmitted to the fire panel. The monitoring window thresholds can be modified to suit the environmental conditions (see *Section 3.3 Airflow monitoring, page 34*). The principal signal curve of the airflow sensor is indicated in *Figure 2.9*.

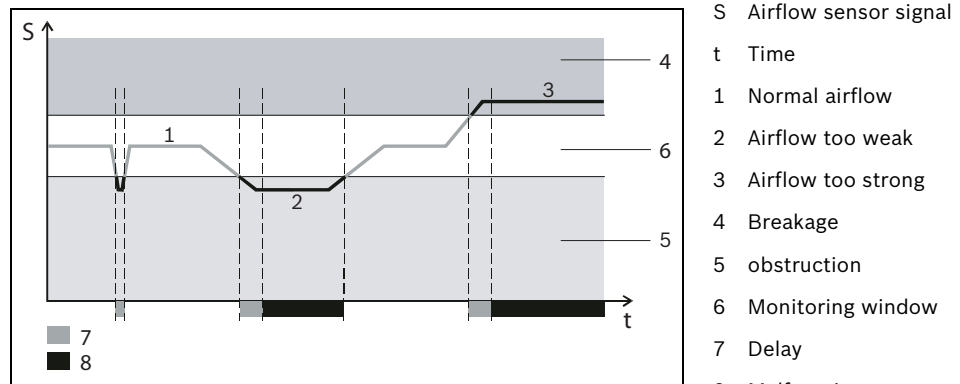


Figure 2.9 Example of the signal process of the airflow sensor in case of malfunctions

Calibrating the Airflow Sensor

The airflow sensor calibration of the FCS-320-TM Aspirating Smoke Detector is performed automatically when the detection unit is inserted into the housing base, provided that the X4 jumper has been plugged into another socket first. This plug-and-play feature makes the FCS-320-TM considerably easier to commission. In addition, the calibration can also be performed using the FAS-ASD-DIAG Diagnostic Software. The initialization phase is therefore carried out according to or independently of the air pressure as desired.

Pipe System

A pipe system with an overall length of up to 50 m can be connected to FCS-320-TM series Aspirating Smoke Detectors over a maximum of 8 aspiration points. A maximum of 5 aspiration points can be connected with ROOM-IDENT.

2.5 FCS-320-TM Series Aspirating Smoke Detectors and Accessories

2.5.1 Overview

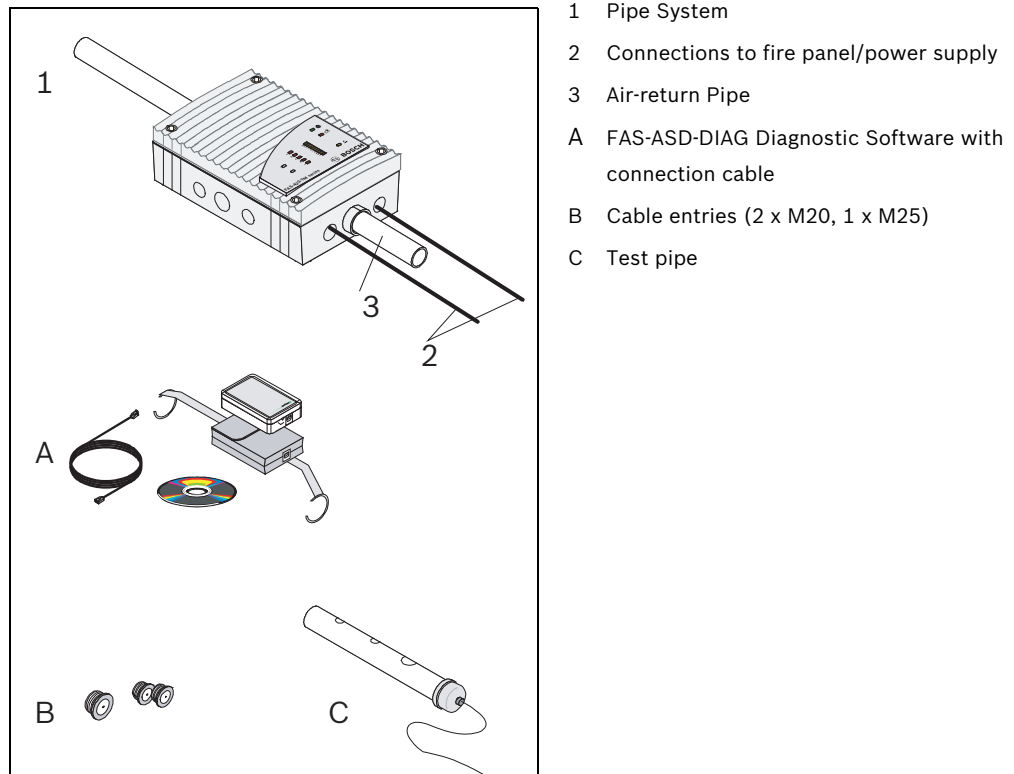


Figure 2.10 Overview of FCS-320-TM series aspirating smoke detectors and accessories

FCS-320-TM series aspirating smoke detectors comprise the following components:

Housing Base

- Connections for pipe with 25 mm external diameter (input and return)
- Pack with cable entries, 1 x M 25 (for cable diameter of 1-18 mm) and 2 x M 20 (for cable diameter of 1-13 mm)
- Screw terminals for securing cables with a thickness of up to 2.5 mm²

detection unit

- Sensitive detection with the latest technology according to the principle of an optical scattered-light smoke detector with integrated airflow monitoring
- Aspiration unit with optimized air routing
- Infrared diagnostics port
- FCS-320-TM: optical displays for main alarm, malfunction and operation
- FCS-320-TM-R: optical displays for fire source identification, main alarm, malfunction and operation

Information on other accessories for special applications can be found in

- *Section 2.5.5 FAS-ASD-DIAG Diagnostic Software*
- *Section 2.6.3 Ceiling Lead-through Adapter*
- *Section 2.6.5 Water Separator for Humid Areas*

2.5.2

FCS-320-TM series connections

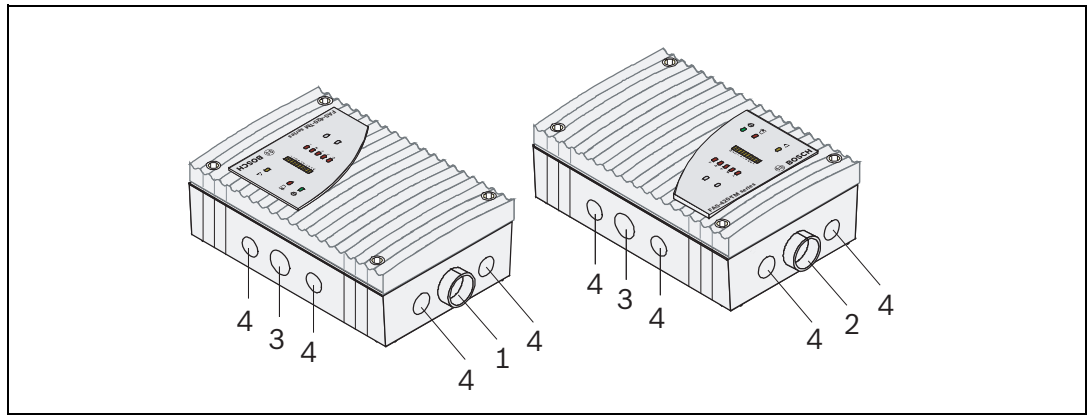


Figure 2.11 FCS-320-TM connections (see table below for explanations)

FCS-320-TM series	Position in Figure 2.11	Function	Explanation
	1	Connection for aspiration pipe	For \varnothing 25 mm pipe system
	2	Connection for air return pipe	For \varnothing 25 mm pipe system
	3	Cable bushing for connection of fire panel and additional power supply (input/output)	2 x M 25
	4	Cable bushing for connection of fire panel and additional power supply (input/output)	8 x M 20

**NOTICE!**

When using fire source identification, it is not permitted to connect an air-return pipe.

2.5.3

FCS-320-TM displays



Figure 2.12 FCS-320-TM displays

FCS-320-TM	Display	LED	Explanation
	Operation	Green	Operation display
	Main alarm	Red	Main alarm display
	Malfunction	Yellow	Malfunction <ul style="list-style-type: none"> - in the pipe system - in the detection unit - caused by fan failure
	Infrared port		Fault diagnosis

2.5.4

FCS-320-TM-R displays

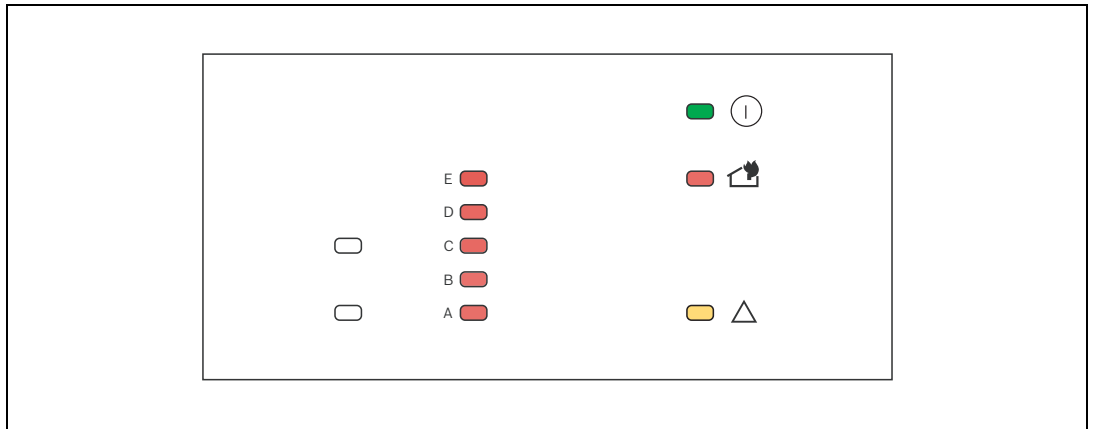


Figure 2.13 FCS-320-TM-R displays

FCS-320-TM-R	Display	LED	Explanation
	Operation	Green	Operation display
	Main alarm	Red	Main alarm display
	Malfunction	Yellow	Malfunction <ul style="list-style-type: none"> - in the pipe system - in the detection unit - caused by fan failure
	Fire source identification for zones A-E	5 red LEDs	fire source identification
	Infrared port		Fault diagnosis

2.5.5 FAS-ASD-DIAG Diagnostic Software

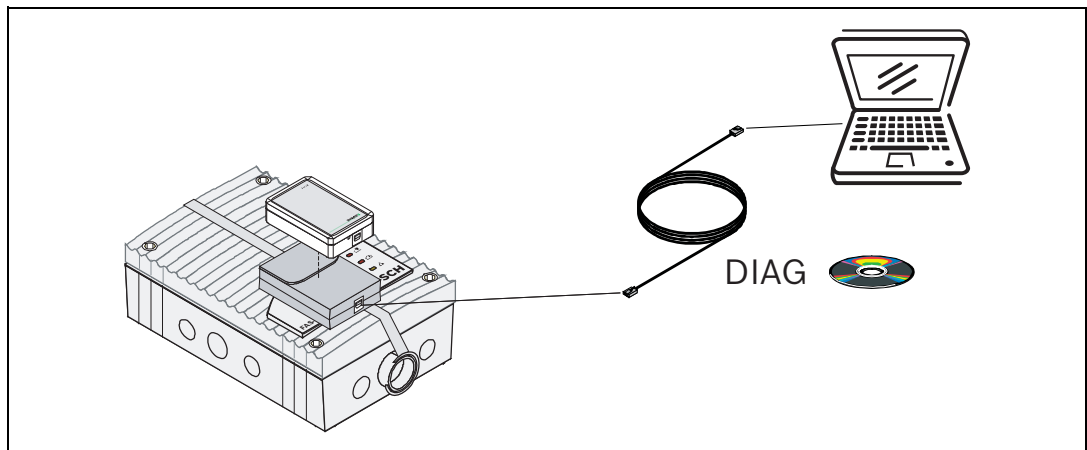


Figure 2.14 Diagnostic software for importing and reading out the device data

The FAS-ASD-DIAG Diagnostic Software enables the saved and current statuses of the FCS-320-TM and error messages to be saved on a PC or laptop.

Data is transmitted to the diagnostic appliance via the infrared port of the aspirating smoke detector. The USB cable provided is used to transmit the data from the diagnostic appliance to the PC/laptop (see *Figure 2.14*).

Windows 2000 or Windows XP can be used as the operating system. For correct color display, the monitor and graphics card must be able to display more than 256 colors.

Diagnostic messages remain saved in the FCS-320-TM for at least 3 days in order to be able to evaluate even short, sporadically occurring errors (e.g. in case of changed operating conditions).

Resetting the FCS-320-TM via the diagnostic software deletes all saved diagnostic messages. The software also allows the deletion of error messages.



NOTICE!

The diagnostic software can be used to save in file format all stored and current diagnostics data and any settings made via the fire panel programming software. To be able to compare the data read out, save each file under a different file name.

2.5.6 External Detector Alarm Displays

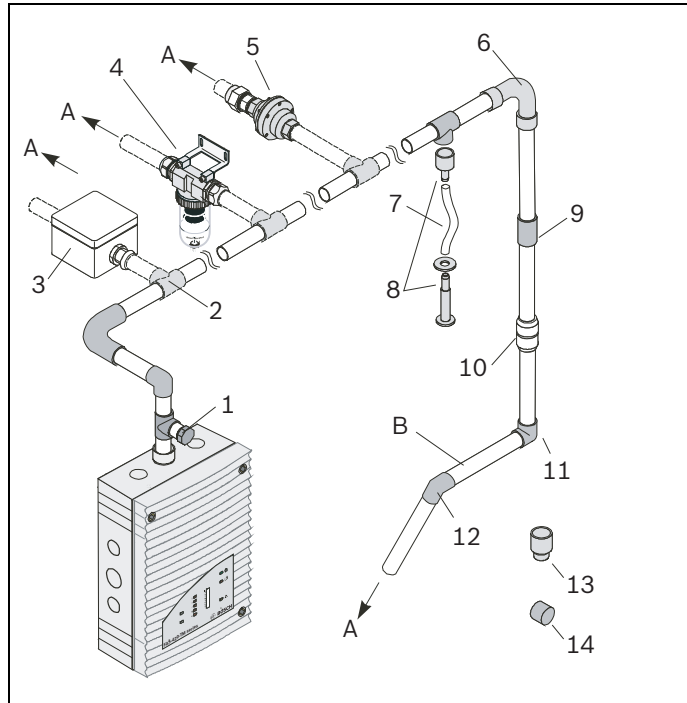
A remote indicator must be connected if the aspirating smoke detector is not directly visible or has been mounted in false ceilings or floors.

The external detector alarm display is installed in an obvious place in halls or entrances of the building section or areas concerned.

Remote indicators can be actuated via the optional relay board. If FNS-320-TM-R variants with fire source identification are used, the remote indicators are assigned to the various monitoring ranges by the relay board and, in the event of a fire, identify the location of the fire.

2.6 Pipe system components

2.6.1 Overview



- A Pipe system connection
- B Smoke aspiration pipe
- 1 Connection for test adapter
- 2 T-fitting
- 3 Air filter
- 4 Water separator
- 5 Detonation safety barrier (not permitted for EN 54-20)
- 6 90° pipe bend
- 7 Aspiration hose for ceiling lead-through
- 8 Ceiling Lead-through Adapter
- 9 fitting
- 10 Double threaded joint
- 11 90° pipe elbow
- 12 45° pipe elbow
- 13 Aspiration reduction
- 14 End cap

Figure 2.15 Pipe system components

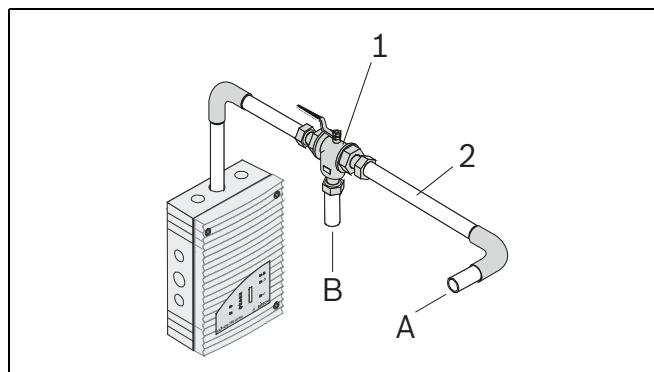
During planning/design, a distinction is drawn between area monitoring and equipment monitoring. For both applications, PVC pipes and halogen-free pipes can be used. The pipes used for equipment monitoring should be halogen-free.

Figure 2.15 shows essential accessory components that can be selected for the application concerned.

The pipe system must be constructed using pipes with an external diameter of 25 mm and the associated fittings.

blowing-out system

In areas that are susceptible to dust particles or icing, it may be necessary to blow out the aspiration pipe system and its air sampling openings. Figure 2.16 shows a manual blowing-out system with a three-way tap.



- A Blast air supply connection
- B Pipe system connection
- 1 Three-way tap
- 2 25 mm aspiration pipe
Aspiration reducing clips

Figure 2.16 Components of manual blowing-out systems

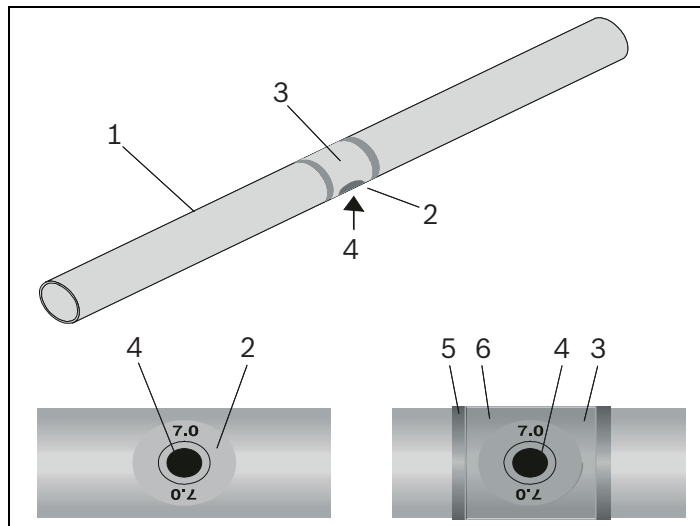
2.6.2

Air sampling openings

Aspiration reducing film sheets

An air sampling opening is a 10 mm bore in the aspiration pipe that is covered with a patented aspiration reducing film sheet with the required opening diameter. The size of the opening depends on the structure of the pipe system (see *Section 3 Planning, page 31*).

The aspiration reducing film sheet is secured with marking tape to prevent it from becoming displaced. The marking tape is a transparent sticky film with red edges and a 10 mm hole. It is placed over the aspiration reducing film sheet so that the air sampling opening is not concealed and can be seen from long distances.

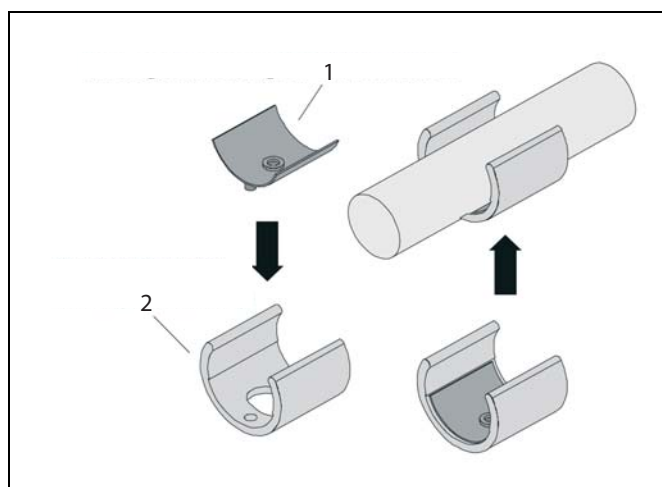


- 1 Smoke aspiration pipe
- 2 Air sampling opening with aspiration reducing film sheet
- 3 Marking tape for aspiration reducing film sheet
- 4 Air sampling opening
- 5 Fire red (RAL 3000)
- 6 Transparent

Figure 2.17 Air sampling opening with aspiration reducing film sheet and marking tape

Aspiration reducing clips

In areas susceptible to obstructions or icing, special, patented ASD aspiration clips with flexible aspiration reductions are used (see *Figure 2.18*).



- 1 Aspiration reduction for deep-freeze facilities
- 2 ASD aspiration clip made of plastic

Figure 2.18 Aspiration reduction for soiled areas and deep-freeze areas

During use in deep-freeze areas, the flexible aspiration reduction expands in the air sampling openings and pushes the ice away during blowing out. The special plastic clip ensures that the aspiration reduction remains at the defined location.

As the clips are more stable under pressure and the elastic rubber insert significantly improves the cleaning effect, they are used for all plans and designs which require a blow-off system due to environmental influences (e.g. increased exposure to dust).



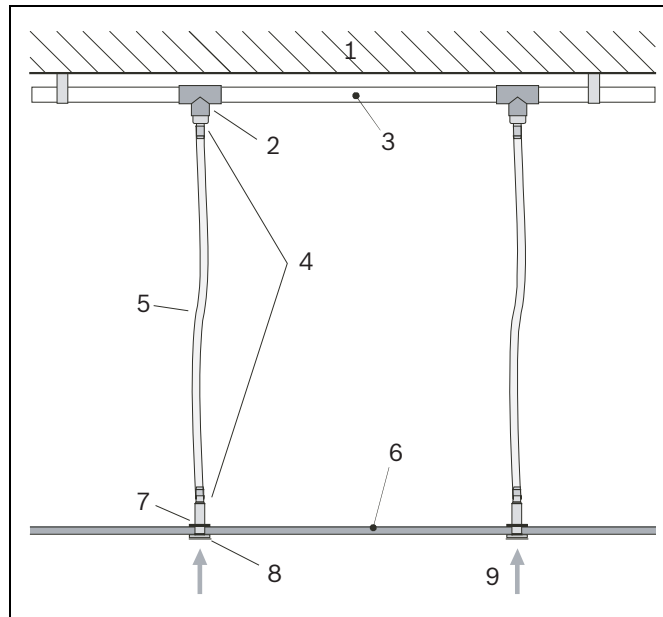
NOTICE!

The standard AF-x aspiration reducing film sheets and the marking tapes are not suitable for use in low-temperature areas.

The aspiration reductions with plastic clips are available separately.

2.6.3

Ceiling Lead-through Adapter



- 1 Ceiling
- 2 T-fitting
- 3 Pipe System
- 4 Complete ceiling lead-through
- 5 Aspiration hose for ceiling lead-through
- 6 false ceiling
- 7 Knurled nut
- 8 Aspiration reducing film sheet
- 9 Aspiration

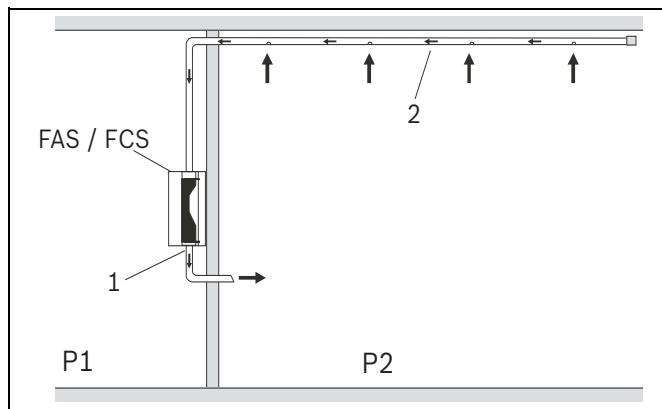
Figure 2.19 Ceiling lead-through adapters

A concealed pipe system for area monitoring can be realized by installing in a false ceiling. This requires the use of ceiling lead-throughs in the false ceiling. The ceiling lead-through can be used with a false ceiling thickness of up to approx. 35 mm. In line with the planning and design guidelines, the ceiling lead-throughs are fitted with aspiration reducing film sheets with defined air sampling openings and connected to the pipe system by means of aspiration hoses (see *Figure 2.19*).

If these hoses do not exceed a maximum of 3 m, the plan according to *Section 3 Planning, page 31* applies. If structural circumstances dictate that lengths in excess of 3 m are used, the pipe system has to be calculated accordingly.

2.6.4

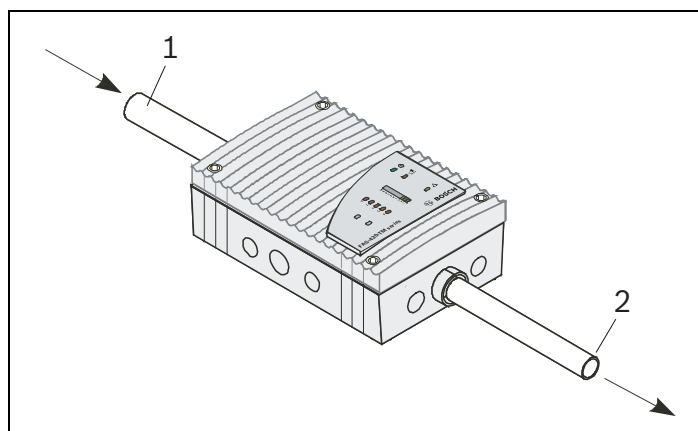
Air-Return Pipe for Pressure Areas and Atmospheric Loads



- P1/P2 Pressure areas 1 and 2
 1 Air-return Pipe
 2 Pipe System

Figure 2.20 Principle of air return

If the aspirating smoke detectors and the pipe system are installed in areas with varying air pressure, the aspirated air must be returned to the pressure area of the pipe system (see *Figure 2.20*). The air-return pipe can serve to equalize pressure or to prevent atmospheric loads (e.g. odors) in neighboring spaces.



- 1 Smoke aspiration pipe
 2 Air-return Pipe

Figure 2.21 FCS-320-TM with air return

The air-return pipe is installed in the conical pipe connection for the air return of the FCS-320-TM (see *Figure 2.21*). It fits perfectly in the connection and guarantees a firm hold. When using fire source identification, it is not permitted to connect an air-return pipe.

2.6.5

Water Separator for Humid Areas

If the smoke aspiration system is operated in environments where condensate can form in the aspiration system, a water separator is used. Condensate can form with sharp temperature fluctuations and in areas where fresh air is monitored. For areas with extremely high humidity, the FAS-ASD-WS Water Separator can be used, for example.

The FAS-ASD-WS Water Separator is integrated at the lowest point in the pipe system downstream of the air filter and the aspirating smoke detector. The 45° pipe elbow permits optimum distance from the wall (see *Figure 2.22*).

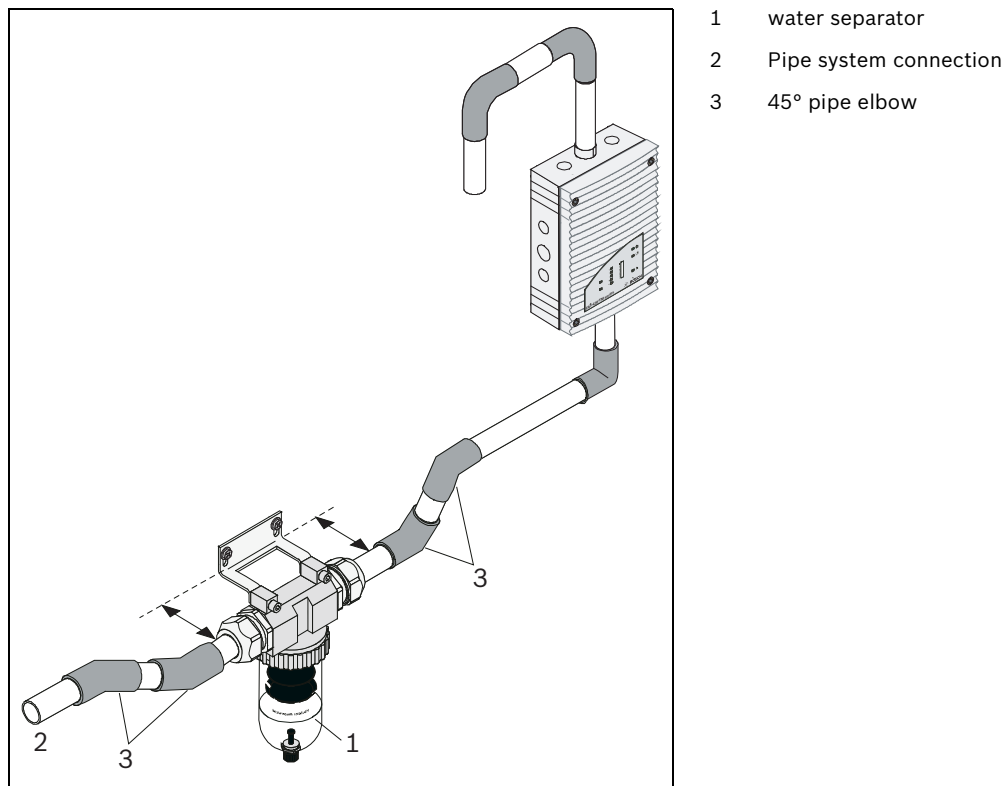


Figure 2.22 FAS-ASD-WS Water Separator for condensing water vapor and collecting condensate from the pipe system

The FAS-ASD-WS Water Separator can be operated in a temperature range from 0 °C to +50 °C. The sintered metal filter in the water separator has a pore width of 50 µm and causes an additional rough absorption of soil particles. The FAS-ASD-WS is supplied with an angle support and PG cable glands. The 45° pipe elbows (4 units) must be ordered separately.

2.7 Scope of Delivery: Smoke Aspiration System

Basic devices and accessories

	Designation	Order number
FCS-320-TM	Standard unit	F.01U.141.195
FCS-320-TM-R	Standard unit	F.01U.141.196
FAS-420-TM-HB	Housing Base	F.01U.078.394
FAS-ASD-DIAG	Diagnostic Software including connection cable, for USB port	F.01U.033.505
FCA-320 relay	Relay board	F.01U.141.200
FCA-320 reset	Reset board	F.01U.141.199
RAS Test Pipe	Test pipe	4.998.148.848
RAS Test Adapter	Test Adapter	4.998.148.849

Pipe system components

	Designation	Order number
FAS-ASD-PHF16	Polywell aspiration hose, flexible, black, halogen-free	F.01U.029.719
FAS-ASD-TRPG16	Ring nut with PG16 internal thread, 5 per set	F.01U.029.721
FAS-ASD-CSL	Quick-lock coupling, straight, PG16 internal thread	F.01U.029.720
FAS-ASD-3WT	Three-way tap, incl. fittings, for 25 mm pipe system	F.01U.029.718
FAS-ASD-F	Flange for ventilation duct	F.01U.029.722
FAS-ASD-AR	Aspiration reduction, with 10 mm bore for attaching an aspiration reducing film sheet, 10 per set	F.01U.029.724
FAS-ASD-CLT	Ceiling lead-through, white, ABS, 10 per set	F.01U.029.725
FAS-ASD-AHC	Aspiration hose (PE) for ceiling lead-through	F.01U.029.727
FAS-ASD-WS	Water Separator with sintered metal filter and manual drain valve, including mounting bracket and PG cable glands for 25 mm pipe system	F.01U.029.717
FAS-ASD-FL	Large air filter box, for 25 mm pipe system, inc. 1 filter set and two PG29 screw connections	F.01U.029.714
FAS-ASD-RFL	Replacement filter set for large air filter box	F.01U.029.715



NOTICE!

Four 45° pipe elbows are required to install the FAS-ASD-WS Water Separator.

Air Sampling Opening Components

Designation	Order number
Marking tape for aspiration reducing film sheet AF-BR, 10 units.	4.998.143.413
Aspiration reducing film sheet 2.0 mm AF-2.0, 10 units.	4.998.143.416
Aspiration reducing film sheet 2.5 mm AF-2.5, 10 units.	4.998.143.417
Aspiration reducing film sheet 3.0 mm AF-3.0, 10 units.	4.998.143.418
Aspiration reducing film sheet 3.2 mm AF-3.2, 10 units.	4.998.143.419
Aspiration reducing film sheet 3.4 mm AF-3.4, 10 units.	4.998.143.420
Aspiration reducing film sheet 3.6 mm AF-3.6, 10 units.	4.998.143.422
Aspiration reducing film sheet 3.8 mm AF-3.8, 10 units.	4.998.143.423
Aspiration reducing film sheet 4.0 mm AF-4.0, 10 units.	4.998.143.424
Aspiration reducing film sheet 4.2 mm AF-4.2, 10 units.	4.998.143.425
Aspiration reducing film sheet 4.4 mm AF-4.4, 10 units.	4.998.143.426
Aspiration reducing film sheet 4.6 mm AF-4.6, 10 units.	4.998.143.427
Aspiration reducing film sheet 5.0 mm AF-5.0, 10 units.	4.998.143.428
Aspiration reducing film sheet 5.2 mm AF-5.2, 10 units.	4.998.143.429
Aspiration reducing film sheet 5.6 mm AF-5.6, 10 units.	4.998.143.430
Aspiration reducing film sheet 6.0 mm AF-6.0, 10 units.	4.998.143.431
Aspiration reducing film sheet 6.8 mm AF-6.8, 10 units.	4.998.143.432
Aspiration reducing film sheet 7.0 mm AF-7.0, 10 units.	4.998.143.433

**NOTICE!**

Plastic clips with marking tape for deep-freeze facilities and blowing-out systems are sold separately.

2.8 Technical data

2.8.1 FCS-320-TM series aspirating smoke detector

Electrical

Auxiliary power supply	15 V DC-30 V DC		
Current consumption from auxiliary power supply	Fan voltage		
	9 V	10.5 V	12 V
- starting current	150 mA		
- In standby	90 mA	110 mA	130 mA
- at Alarm	125 mA	135 mA	150 mA

Mechanics

Displays in the FCS-320-TM unit	
- Operation	Green LED
- Malfunction	yellow LED
- Alarm	1 red LED for main alarm
- infrared port	IR transmitter/receiver
Displays in the FCS-320-TM-R unit	
- Operation	Green LED
- Malfunction	yellow LED
- Alarm	1 red LED for main alarm
- Fire location display	5 red LEDs (for zones A-E)
- infrared port	IR transmitter/receiver
Conical duct connections for \varnothing 25 mm	
- Aspiration pipe	1 pipe
- Air-return Pipe	1 pipe
Cable bushings	
- Housing base sides	8 x M 20 and 2 x M 25
- Housing base rear wall	4 x M 25
Dimensions (H x W x D)	222 x 140 x 70 mm
Weight	Approx. 0.8 kg
Housing material	Plastic (ABS)
Housing color	Papyrus white (RAL 9018)

Environmental conditions

Protection category according to EN 60529	
- Without air return	IP 20
- With pipe section 100 mm/pipe bend	IP 42
- With air return	IP 54
Permissible temperature range of aspirating smoke detector	-20 °C to +60 °C
Permissible relative humidity (non-condensing)	Max. 95%

Special features

Sound power level (at 9 V fan voltage)	40 dB(A)
Response sensitivity (light obscuration)	0.5 to 2.0%/m
Life cycle of fan (at 12 V and 24 °C)	60,000 hrs

2.8.2**Pipe System**

Maximum pipe length Ø 25 mm	50 m
Additional maximum pipe length Ø 12 mm	8 x 3 m
Maximum number of air sampling openings	8
Maximum length of aspiration hose per ceiling lead-through	3 m
Maximum size of monitoring area	400 m ²
Permissible temperature range	
– PVC pipe system	0 °C to +60 °C
– ABS pipe system	-40 °C to +80 °C

2.8.3**Smoke Aspiration System Components****Water separator (FAS-ASD-WS)**

Features	For use in areas with very high humidity
	Plastic housing with manual drain valve
	Sintered metal filter
	PG cable glands for 25 mm pipe system
	Incl. assembly bracket
Dimensions (W x H x D)	210 x 170 x 90 mm
Weight	Approx. 1.4 kg

Filterbox, large (FAS-ASD-FL)

Features	For use in areas with increased exposure to dust
	Incl. filter set and two PG29 cable glands
Housing material	ABS plastic
Housing color	Light gray RAL 7035
Dimensions (W x H x D)	194 x 122 x 96 mm
Application temperature range	-30 °C to +70 °C

Replacement filter set, large (FAS-ASD-RFL)

Features	Set comprising one fine, one medium and one coarse filter insert (60 ppi, 45 ppi and 25 ppi)
Application temperature range	-30 °C to +70 °C

Three way tap (FAS-ASD-3WT)

Features	With 3 transition threads for connection to a 25 mm pipe system
Operating pressure	Max. 10 bar
Housing material	PVC plastic
seal	Teflon (PTFE)
Length	131 mm
Application temperature range	0 °C to +50 °C

Ceiling lead-through (FAS-ASD-CLT) with aspiration hose (FAS-ASD-AHC)

Maximum false ceiling thickness	35 mm
Max. length of aspiration hose per ceiling lead-through	1 m
Ceiling lead-through fitting material	ABS
Aspiration hose material	PE
Color of aspiration hose and ceiling lead-through	White
Application temperature range	-40 °C to +80 °C

3 Planning

3.1 Regulations

The planning regulation below is based on the system limits of the FAS-320-TM series. Here, the corresponding national regulations of the countries in their respectively applicable version must be adhered to and planning must be adjusted to these.

The planning for the aspirating smoke detector in accordance with EN 54-20 is described below. The basic conditions are specified in *Section 3.1 Regulations*. Planning must be carried out in accordance with *Section 3.6 Standard Pipe Planning*. In addition to 3.6, special applications are also bound by the restrictions of the planning notes in accordance with *Section 3.7 Planning with Single-hole Monitoring* and the following sections. These must be taken into account from the start in the case of any special planning processes.

Planning options in accordance with EN 54-20:

Various technical solutions are available to suit different planning criteria. The following table lists the chapters in which the solutions are described.

Planning criteria	Technical solution	Principles	Restriction
Area monitoring in general	Basic planning	3.6	
Detection of failure of a single opening	Single-hole monitoring planning	3.6	3.7
Equipment protection/cabinet monitoring	Simplified Pipe Planning	3.6	3.8
Ventilation ducts	Planning for Forced Airflow	3.6	3.9

With regard to the planning regulation below, the applicable national regulations of the countries concerned must be observed and the plans modified accordingly.

EN 54-20

For VdS systems, compliance is also required with the following guidelines:

- "Guideline for automatic fire detection systems, planning and installation", VdS Schadenverhütung GmbH, Cologne (VdS 2095)
- The guideline "Installation protection for electrical and electronic systems" VdS Schadenverhütung GmbH, Cologne (VdS 2304)
- The "Planning Aspirating Fire Detectors" data sheet from VdS Schadenverhütung GmbH, Cologne (VdS 3435)

The applicable national regulations must also be observed, for example in Germany:

- DIN VDE 0833 parts 1 and 2 "Alarm systems for fire, intrusion and hold-up"
- Additional provisions for the installation of fire detection systems, which are published by fire directors of fire departments, by the construction supervision authorities or by the construction law authorities that have only local validity.

NOTICE!

- For planning, the system limits in accordance with *Section 3.5 Planning Limits* are to be observed.
- Select airflow monitoring and the associated planning limits (see *Section 3.3 Airflow monitoring*) and check these for any restrictions imposed by country-specific regulations.
- If the on-site planning deviates from the standard plans described below, this must always be checked with activation attempts for correct detection of a malfunction and a fire. A special plan may be required.
- Plans not contained in the operation guide must be requested.



3.2 Principles of Pipe Planning

The aspiration pipe network must be designed such that all possible fires in the monitoring range can be dealt with at an early stage.

The number of air sampling openings and the structure of the pipe system depend on the size and geometry of the monitoring range. The pipe system must be laid out according to the planning guidelines in this chapter, taking into account the following issues:

Symmetrical structure

The pipe system should preferably have a symmetrical structure, i.e.

- Same number of air sampling openings per pipe branch
- Same pipe branch lengths (should not exceed $\pm 20\%$ deviation)
- Same distance between neighboring air sampling openings on the smoke aspiration pipe (should not exceed $\pm 20\%$ deviation).

Asymmetrical structure

If structural circumstances dictate that the pipe system is to be designed asymmetrically (see *Figure 3.1*), the following conditions apply:

- The number of air sampling openings and the length of the shortest and longest pipe branch within the pipe system must not exceed a quantity ratio of 1:2.
- The distance between neighboring air sampling openings on the smoke aspiration pipe must be equal (should not exceed $\pm 20\%$ deviation).
- The diameters of the air sampling openings are determined separately for each pipe branch. The diameters depend on the total number of air sampling openings in the pipe branch in question.

Figure 3.1 shows a typical U-pipe system with three or six air sampling openings and the air sampling opening diameters calculated according to *Section 3.6 Standard Pipe Planning*.

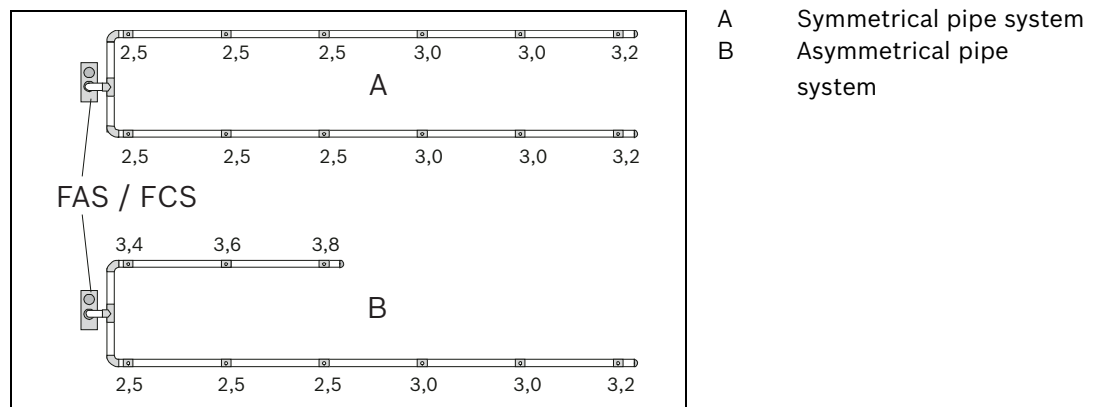


Figure 3.1 Example of a symmetrical and an asymmetrical U-pipe system

Pipe diameter

As a rule, the pipe system is created using pipes with an external diameter of 25 mm. PVC or halogen-free pipes can be used. Halogen-free pipes are to be used in preference for equipment monitoring.

Branch length

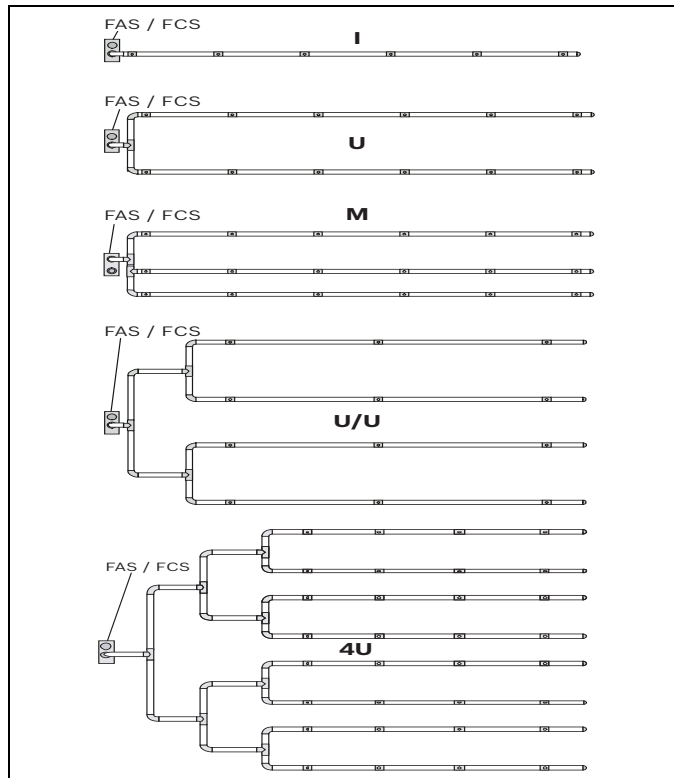
To achieve short transport times for the smoke aerosols in the aspiration pipe and thus quick detection, it is better to plan several short branches than fewer long ones (preferably U and double U-pipe system).

Pipe configurations

Depending on the area geometry, five pipe configurations can be selected (see *Figure 3.2*):

- I-pipe: pipe system without branches.

- **U-pipe:** pipe system that branches into two pipe branches.
- **M-pipe:** pipe system that branches into three pipe branches.
- **Double U-pipe:** pipe system that branches symmetrically into four pipe branches.



- I I-pipe system
- U U-pipe system
- M M-pipe system
- U/U Double U-pipe system

Figure 3.2 Pipe configurations

Change of direction

Elbows and bends in the pipe system increase flow resistance. Therefore, they should only be used where they cannot be avoided for structural engineering reasons.

	Corresponds to a straight pipe length of
Pipe elbow	1.5 m
Pipe bend	0.3 m

If elbows or bends are used, the maximum total length of the pipe system is reduced.



NOTICE!

It is preferable to use pipe bends rather than pipe elbows. The detection time will be influenced significantly by too high a number of changes of direction.

Testing

For critical applications, test the secure detection with activation attempts. Check also whether there is airflow at the individual air sampling openings.



NOTICE!

In order to increase transport speed in critical application areas, the fan voltage can be increased from 6.9 V to 9 V.

3.3 Airflow monitoring

EN 54-20 requires the detection of a 20-percent change in the airflow volume by the detector module's airflow sensor. In order to achieve this, the activation threshold of the airflow sensor must be set to less than or equal to 20%. It is recommended that airflow calibration is carried out dependent on air pressure for both of these settings. In systems that do not need to comply with EN 54-20, any threshold can be set. The smoke aspiration pipes are planned taking into account the applicable national regulations for the country concerned.

Adapting the airflow sensitivity

The sensitivity of the airflow sensor must be adapted to the application. Breakages and obstructions must be accurately detected in the event of a malfunction.

The trigger threshold, and thus the sensitivity of the airflow sensor, can be set from 10 to 50%.

	Complies with EN 54-20			
Activation threshold	10%	20%	40%	50%
Sensitivity	Very high	High	Average	Low



NOTICE!

Selection of the largest possible, precisely still-approved level is recommended.

Dynamic airflow sensors

The airflow monitoring of the unit makes it possible to detect breaks at the end of pipes and identify sudden obstruction of individual air sampling openings (e.g. following tampering with the pipe system). If the dynamic airflow sensors were activated via the diagnostic software, note the following restrictions.

Restrictions

Airflow monitoring may only be set to level I if

- planning was carried out in accordance with "single-hole monitoring" (see *Section 3.7 Planning with Single-hole Monitoring, page 42*),
- the airflow sensor was calibrated dependent on air pressure (*Section 6.3.2 Air-Pressure-Dependent Calibration, page 77*)
- and no larger airflow fluctuations can occur.

Air pressure differences

There must be equal air pressure along the length of the aspiration pipe.



NOTICE!

If the aspirating smoke detectors and the pipe system are positioned in areas with different air pressures, the air aspirated by the FCS-320-TM must be returned to the pressure area of the pipe system (see *Section 2.6.4 Air-Return Pipe for Pressure Areas and Atmospheric Loads, page 24*).



NOTICE!

FCS-320-TM series detectors with active fire source identification must be installed outside the areas to be monitored and without an air-return pipe.



NOTICE!

As an air-return pipe needs to be provided when the FCS-320-TM series is used in areas with varying air pressures, and given that no air-return pipe is possible with ROOM-IDENT, it is not possible to use the FCS-320-TM series with ROOM-IDENT in areas with varying or fluctuating air pressures.

3.4

Defining the Response Sensitivity

The sensitivity of smoke aspiration systems can be divided into certain fire sensitivity classes in accordance with EN 54-20. These fire sensitivity classes describe specific examples of ways in which the systems can be applied. The permissible system plans given in 3.6 can be determined for each classification. Smoke aspiration systems with a higher fire sensitivity class according to EN 54-20 also satisfy the requirements of the lower classes.

Class	description	Application example
A	Aspirating smoke detector with extremely high sensitivity	Very early detection: significant smoke dilution through air conditioning in IT areas
B	Aspirating smoke detector with increased sensitivity	Early detection: significant time gains thanks to very early fire detection (without air condition)
C	Smoke aspiration system with normal sensitivity	Normal detection: fire detection with the advantages of smoke aspiration systems



NOTICE!

Depending on the number of air sampling openings, fire sensitivity classes A, B and C can all be achieved with the detector modules available.

The table shows the sensitivities you can choose from

	Sensitivity	Standard sensitivity	FAS-ASD-DIAG settings intervals
Detector module	0.5 - 2%/m	0.5%/m	0.1 %/m

The planning of the monitoring area always occurs according to the national guidelines for point-type smoke detectors.

3.5 Planning Limits

The following limiting values must always be observed for the FCS-320-TM series:

Limiting values	Maximum monitoring area per air sampling opening	Corresponds to the maximum monitoring range for point detectors, in line with applicable national norms.
	Maximum number of air sampling openings per pipe system ¹	8
	Maximum number of air sampling openings per pipe system with fire source identification	5
	Maximum pipe length per pipe system ²	
	– Pipe Ø 25 mm	50 m
	– Additional pipe Ø 12 mm	8 x 3 m
	Maximum total monitoring area per pipe system	400 m ²
	Minimum pipe length between 2 air sampling openings	0.1 m
	Minimum pipe length between 2 air sampling openings with fire source identification	3 m
	Minimum pipe length between 2 air sampling openings	10 m
	¹ Plans not contained in the operation guide must be requested	
	² Depending on the selected plan, some restricted values may apply	

The maximum total monitoring area of the FCS-320-TM and the maximum total pipe length depend on the plan selected (see *Section 3.6 Standard Pipe Planning*).



NOTICE!

The planning limits specified in this operation guide may be restricted in line with country-specific regulations.

3.6 Standard Pipe Planning

In order to plan in accordance with the EN 54-20 standard, certain factors must be known, such as the system sensitivity requirements, the number of air sampling openings and the accessories needed for the application concerned. These factors can be used to determine the appropriate standard-compliant construction of the pipe system using the following chapter and the planning table in the appendix.

3.6.1 Determining the Necessary Accessories

As accessory components, e.g. filters, have a particular effect on the dimensions of pipe planning, the appropriate accessory must be selected for the application concerned in advance. Retrofitting an accessory, e.g. a fine filter, is largely only possible if a certain reserve is planned in advance.

The following components must be taken into account in this regard:

- Air filter
- water separator
- Three-way-tap

See 2.8.3

3.6.2 Pipe Planning with Pipe Accessories

For the purpose of pipe system planning, the following planning table is available for all selected pipe accessories.

- Planning without air filter
- Planning with FAS-ASD-FL air filter



NOTICE!

In order to improve the detection quality of a smoke aspiration system, an area can be monitored with more detection points than required by national guidelines. However, to calculate the necessary sensitivity of an aspirating smoke detector, the number of aspiration points required by the standard must be used.

Procedure

In the following **example**, a plan without air filter with 4 openings, not fitted with any other accessories, should satisfy class B. The red shaded areas show the potential plans with different pipe shapes and fan voltage.

	General	Example
1.	<p>Selection: Select the planning table with or without air filter, as applicable.</p> <p>Result: Planning table and specified air filter</p>	Select the planning table with air filter, <i>Section 3.6.3 Planning with Air Filter, page 39</i>
2.	<p>Selection: Select the number of air sampling openings from the planning table. Note the possible sensitivity classes.</p> <p>Result: Specified detector module with specified setting and alarm threshold</p>	In the <i>Section 3.6.3 Planning with Air Filter, page 39</i> table, select the column with four air sampling openings (Number of air sampling openings, 4)
3.	<p>Selection: Select the sensitivity (sensitivity class) of the system according to the gradation described in <i>Section 3.4 Defining the Response Sensitivity</i>.</p> <p>Result: Specified sensitivity class in accordance with EN 54-20</p>	In the <i>Section 3.6.3 Planning with Air Filter, page 39</i> table, select the response sensitivity you require (class A, B or C) from the column highlighted in red. You must select the class that corresponds to the configured sensitivity.
4.	<p>Selection: Select other pipe components, such as a water separator.</p> <p>Result: Specified planning table</p>	Select the <i>Section Without any other pipe accessories, page 39</i> table.
5.	<p>Selection: Select the possible pipe length for the relevant pipe shape and fan voltage.</p> <p>Result: Specified planning in accordance with EN 54-20 for the previously specified parameters</p>	In the <i>Section Without any other pipe accessories, page 39</i> table, select the pipe shape and fan voltage you require, and note the permissible total pipe length.

You will find the planning tables in question in *Section 8.1 Planning without air filter, page 94* and *Section 8.2 Planning with Air Filter, page 95*.

Abbreviation	Meaning
S	Sensitivity (% LT/m)
MA	Main alarm
PA	Pre-alarm
l [m]	Permissible total pipe length in meters

3.6.3 Planning with Air Filter

Sensitivity (% LT/m)	Number of openings							
	1	2	3	4	5	6	7	8
0.5	A	A	B	B	B	C	C	C
0.6	A	B	B	B	C	C	C	C
0.7	A	B	B	C	C	C	C	C
0.8	A	B	B	C	C	C	C	C
0.9	A	B	C	C	C	C	C	C
1.0	A	B	C	C	C	C	C	C
1.1	B	B	C	C	C	C	C	
1.2	B	B	C	C	C	C		
1.3	B	C	C	C	C	C		
1.4	B	C	C	C	C			
1.5	B	C	C	C	C			
1.6	B	C	C	C	C			
1.7	B	C	C	C				
1.8	B	C	C	C				
1.9	B	C	C	C				
2.0	B	C	C	C				

Without any other pipe accessories

Pipe shape	U _{Fan} [V]	1	2	3	4	5	6	7	8
I	≥9	40	40	40	40	40			
U	≥9	50	50	50	50	50	50	50	50
M	≥9	50	50	50	50	50	50	50	50
Double U	≥9	50	50	50	50	50	50	50	50

Pipe length in [m]

With water separator

Pipe shape	U _{Fan} [V]	1	2	3	4	5	6	7	8
I	≥9	40	40	40					
U	≥9	50	50	50	50	50	50		
M	≥9	50	50	50	50	50	50		
Double U	≥9	50	50	50	50	50	50	50	50

Pipe length in [m]

Results for class B

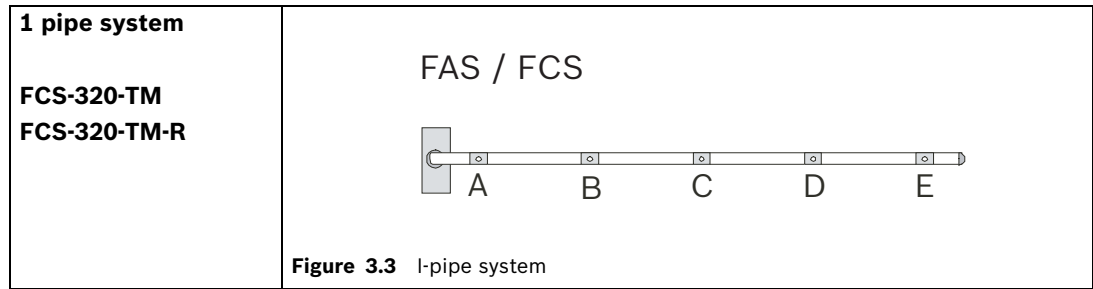
Detector module with a sensitivity of 0.5% LT/m or 0.6% LT/m.

System parameters possible:

- I-pipe system
 - ≥ 9 V fan voltage, max. 40 m total pipe length
- U-pipe system
 - ≥ 9 V fan voltage, max. 50 m total pipe length
- M-pipe system
 - ≥ 9 V fan voltage, max. 50 m total pipe length
- Double U-pipe system
 - ≥ 9 V fan voltage, max. 50 m total pipe length

3.6.4 Opening Diameter

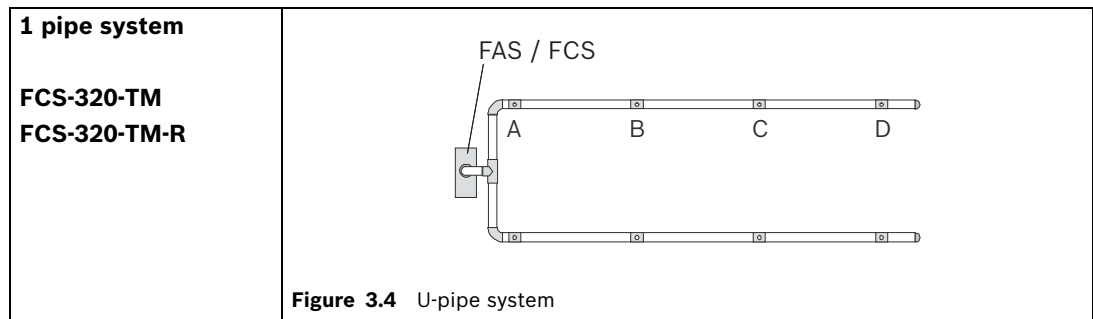
I-pipe system



I-pipe system	Air sampling opening	Number of air sampling openings				
		1	2	3	4	5
Ø of air sampling openings in mm^a	A	6.8	5.0	4.2	3.4	3.0
	B	-	5.0	4.2	3.6	3.2
	C	-	-	4.4	3.8	3.4
	D	-	-	-	4.0	3.6
	E	-	-	-	-	4.4

^a Punch diameter of the aspiration reducing film sheet

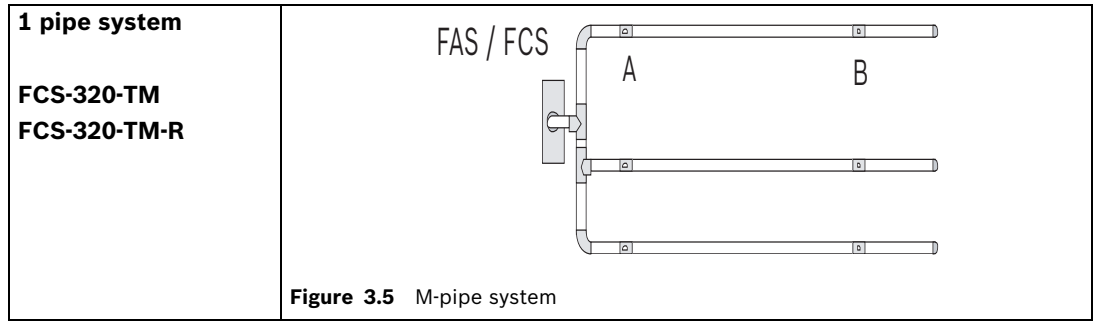
U-pipe system



U-pipe system	Air sampling opening	Number of air sampling openings			
		2	4	6	8
Ø of air sampling openings in mm^a	A	6.0	4.2	3.4	3.0
	B	-	4.6	3.6	3.0
	C	-	-	4.4	3.6
	D	-	-	-	4.0

^a Punch diameter of the aspiration reducing film sheet

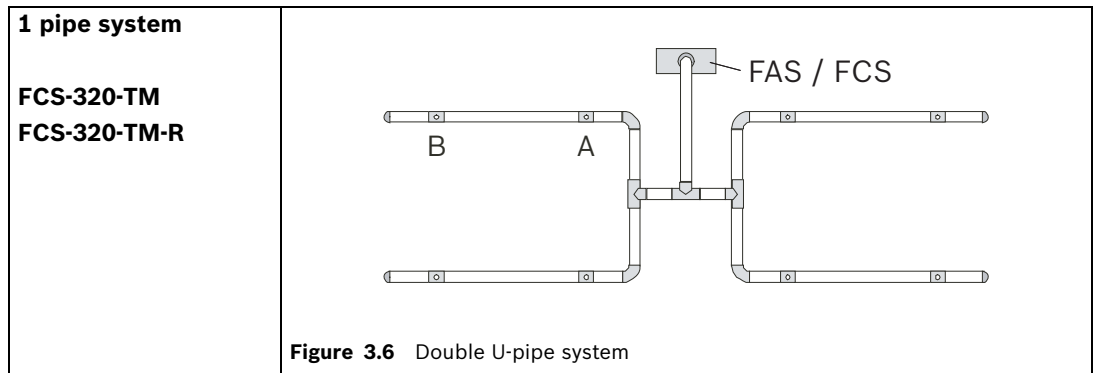
M-pipe system



M-pipe system	Air sampling opening	Number of air sampling openings	
		3	6
Ø of air sampling openings in mm^a	A	5.0	3.6
	B	-	4.0

^a Punch diameter of the aspiration reducing film sheet

Double U-pipe system



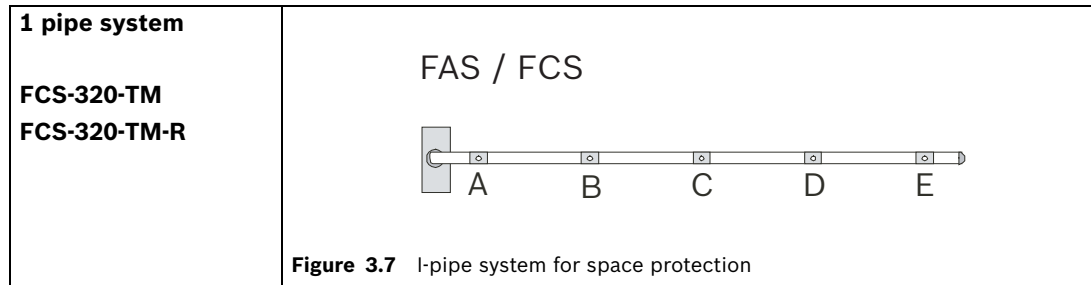
Double U-pipe system	Air sampling opening	Number of air sampling openings	
		4	8
Ø of air sampling openings in mm^a	A	4.4	3.0
	B	-	3.8

^a Punch diameter of the aspiration reducing film sheet

3.7 Planning with Single-hole Monitoring

Depending on the pipe configuration, the following system parameters are used to detect a single air sampling opening or a particular number of obstructed air sampling openings. Planning is to be carried out according to regulations specified in *Section 3.6 Standard Pipe Planning, page 37*. Additionally, the following limiting values and opening diameters must be observed. An additional accessory (air filter, condensate separator etc.) can have an effect on the maximum pipe length.

3.7.1 I-pipe system



Min. distance FCS-320-TM – 1st air sampling opening	2 m
Max. distance FCS-320-TM – 1st air sampling opening	20 m
Max. total pipe length per pipe system	
– Pipe Ø 25 mm	40 m
– Additional pipe Ø 12 mm	5 x 3 m
Max. total pipe length per pipe system for a fan voltage < 10.5 V	
– Pipe Ø 25 mm	30 m
– Additional pipe Ø 12 mm	5 x 3 m
Min. distance between 2 air sampling openings (d)	4 m
Max. distance between 2 air sampling openings (d)	10 m
Max. number of air sampling openings (n) per pipe system	5 units

I-pipe system	Air sampling opening	Number of air sampling openings				
		1	2	3	4	5
Ø of air sampling openings in mm ^a	A	6.8	4.6	4.0	3.4	3.0
	B	-	5.0	4.2	3.6	3.2
	C	-	-	4.4	3.8	3.4
	D	-	-	-	4.0	3.6
	E	-	-	-	-	3.8

^a Punch diameter of the aspiration reducing film sheet

I pipe system activation thresholds

I-pipe system	Number of obstructed air sampling openings	Number of air sampling openings			
		2	3	4	5
Activation threshold	1 obstructed opening	± 30%	± 20%	± 15%	± 10%
	2 obstructed openings	0	0	± 30%	± 20%
	3 obstructed openings	0	0	0	0
	4 obstructed openings	0	0	0	0
	5 obstructed openings	0	0	0	0
0 not practical					

Example:

If 2 of a total of 5 air sampling openings are found to be obstructed, airflow monitoring must be set to ± 20% using the FAS-ASD-DIAG Diagnostic Software.

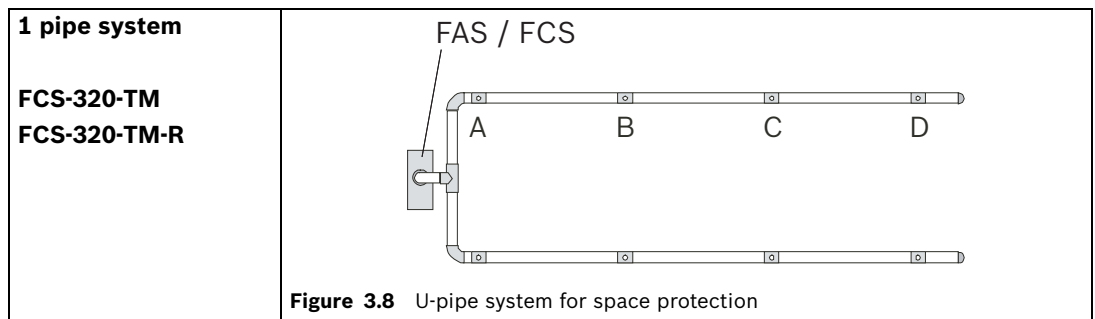


NOTICE!

When planning in accordance with EN 54-20, airflow monitoring must always be set to 20%.

3.7.2

U-pipe system



Min. distance FCS-320-TM – 1st air sampling opening	2 m
Max. distance FCS-320-TM – 1st air sampling opening	20 m
max. branch length	25 m
Max. total pipe length per pipe system	
– Pipe Ø 25 mm	50 m
– Additional pipe Ø 12 mm	8 x 3 m
Max. total pipe length per pipe system for a fan voltage < 10.5 V	
– Pipe Ø 25 mm	40 m
– Additional pipe Ø 12 mm	8 x 3 m
Min. distance between 2 air sampling openings (d)	4 m
Max. distance between 2 air sampling openings (d)	10 m
Max. number of air sampling openings (n) per pipe system	8 units

U-pipe system	Air sampling opening	Number of air sampling openings			
		2	4	6	8
Ø of air sampling openings in mm ^a	A	6.0	4.2	3.4	3.0
	B	-	4.4	3.6	3.0
	C	-	-	3.6	3.2
	D	-	-	-	3.2

^a Punch diameter of the aspiration reducing film sheet

U-pipe system activation thresholds

U-pipe system	Number of obstructed air sampling openings	Number of air sampling openings			
		2	4	6	8
Activation threshold per pipe system	1 obstructed opening	± 25%	± 15%	-	-
	2 obstructed openings	0	± 25%	± 20%	± 15%
	3 obstructed openings	0	0	± 30%	± 25%
	4 obstructed openings	0	0	0	± 35%
	5 obstructed openings	0	0	0	0
	6 obstructed openings	0	0	0	0
	7 obstructed openings	0	0	0	0

0 not practical
- not possible

Example:

If 3 of a total of 8 air sampling openings are found to be obstructed, airflow monitoring must be set to ± 25% using the FAS-ASD-DIAG Diagnostic Software.

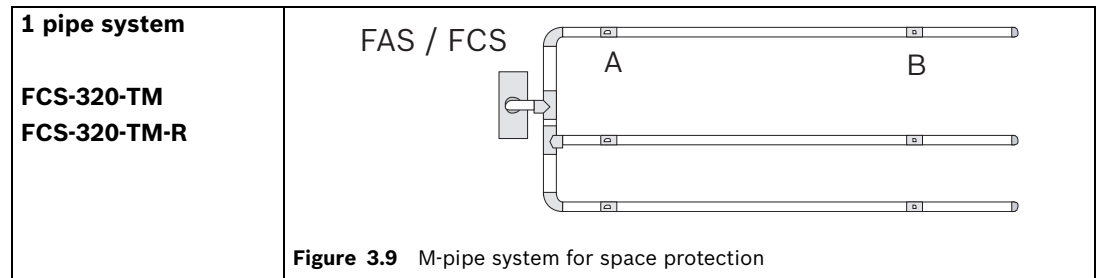


NOTICE!

When planning in accordance with EN 54-20, airflow monitoring must always be set to 20%.

3.7.3

M-pipe system



Min. distance FCS-320-TM – 1st air sampling opening	2 m
Max. distance FCS-320-TM – 1st air sampling opening	20 m
max. branch length	16.5 m
Max. total pipe length per pipe system	
– Pipe Ø 25 mm	50 m
– Additional pipe Ø 12 mm	8 x 3 m
Max. total pipe length per pipe system for a fan voltage < 10.5 V	
– Pipe Ø 25 mm	40 m
– Additional pipe Ø 12 mm	8 x 3 m
Min. distance between 2 air sampling openings (d)	4 m
Max. distance between 2 air sampling openings (d)	10 m
Max. number of air sampling openings (n) per pipe system	6 units

M-pipe system	Air sampling opening	Number of air sampling openings	
		3	6
Ø of air sampling openings in mm^a	A	5.0	3.6
	B	-	3.8

^a Punch diameter of the aspiration reducing film sheet

M-pipe system activation thresholds

M-pipe system	Number of obstructed air sampling openings	Number of air sampling openings	
		3	6
Activation threshold per pipe system	1 obstructed opening	± 30%	± 15%
	2 obstructed openings	0	± 30%
	3 obstructed openings	0	0
	4 obstructed openings	0	0
	5 obstructed openings	0	0
	6 obstructed openings	0	0

0 not practical
- not possible

Example:

If 1 of a total of 6 air sampling openings is found to be obstructed, airflow monitoring must be set to ± 15% using the FAS-ASD-DIAG Diagnostic Software.

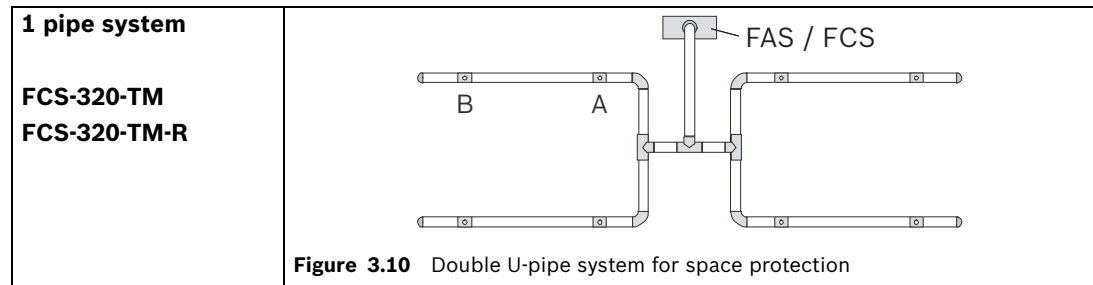


NOTICE!

When planning in accordance with EN 54-20, airflow monitoring must always be set to 20%.

3.7.4

Double U-pipe system



Min. distance FCS-320-TM – 1st air sampling opening	2 m
Max. distance FCS-320-TM – 1st air sampling opening	20 m
max. branch length	12.5 m
Max. total pipe length per pipe system	
– Pipe Ø 25 mm	50 m
– Additional pipe Ø 12 mm	8 x 3 m
Max. total pipe length per pipe system for a fan voltage < 10.5 V	
– Pipe Ø 25 mm	40 m
– Additional pipe Ø 12 mm	8 x 3 m
Min. distance between 2 air sampling openings (d)	4 m
Max. distance between 2 air sampling openings (d)	10 m
Max. number of air sampling openings (n) per pipe system	8 units

Double U-pipe system	Air sampling opening	Number of air sampling openings	
		4	8
Ø of air sampling openings in mm ^a	A	4.4	3.0
	B	-	3.2

^a Punch diameter of the aspiration reducing film sheet

Double U-pipe system activation thresholds

Double U-pipe system	Number of obstructed air sampling openings	Number of air sampling openings	
		4	8
Activation threshold per pipe system	1 obstructed opening	± 15%	-
	2 obstructed openings	± 30%	± 15%
	3 obstructed openings	0	± 25%
	4 obstructed openings	0	± 35%
	5 obstructed openings	0	0
	6 obstructed openings	0	0

0 not practical
- not possible

Example:

If 3 of a total of 8 air sampling openings are found to be obstructed, airflow monitoring must be set to ± 25% using the FAS-ASD-DIAG Diagnostic Software.

**NOTICE!**

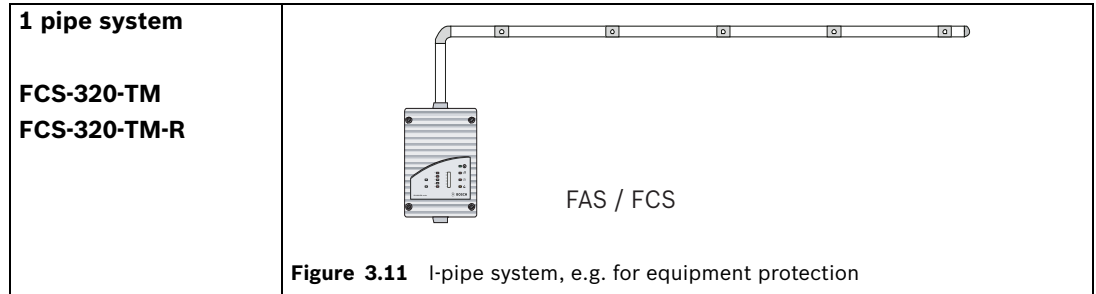
When planning in accordance with EN 54-20, airflow monitoring must always be set to 20%.

3.8 Simplified Pipe Planning

Simplified planning is used for equipment protection and in premises with smaller dimensions. The benefit of this type of planning is the standard diameters of the suction openings.

Planning is to be carried out according to regulations specified in *Section 3.6 Standard Pipe Planning, page 37*. Additionally, the following limiting values and opening diameters must be observed. An additional accessory (air filter, condensate separator etc.) can have an effect on the maximum pipe length.

3.8.1 I-Pipe System - Simplified Planning

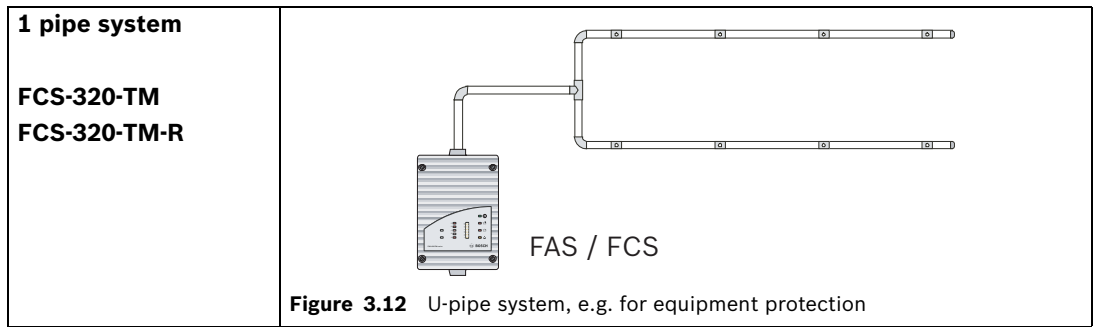


Limiting values	Min. distance FCS-320-TM – 1st air sampling opening	2 m
	Max. distance FCS-320-TM – 1st air sampling opening	20 m
	Max. total pipe length per pipe system	
	– Pipe Ø 25 mm	40 m
	– Additional pipe Ø 12 mm	5 x 3 m
	Max. total pipe length per pipe system for a fan voltage < 10.5 V	
	– Pipe Ø 25 mm	30 m
	– Additional pipe Ø 12 mm	5 x 3 m
	Max. number of air sampling openings (n) per pipe system	5 units
Min. distance between 2 air sampling openings	0.1 m	
Max. distance between 2 air sampling openings	4 m	
Min. distance between 2 air sampling openings for fire source identification	3 m	

I-pipe system	Number of air sampling openings				
	1	2	3	4	5
Ø of all air sampling openings in mm^a	6.8	4.6	4.0	3.6	3.4

^a Punch diameter of the aspiration reducing film sheet

3.8.2 U-Pipe System - Simplified Planning

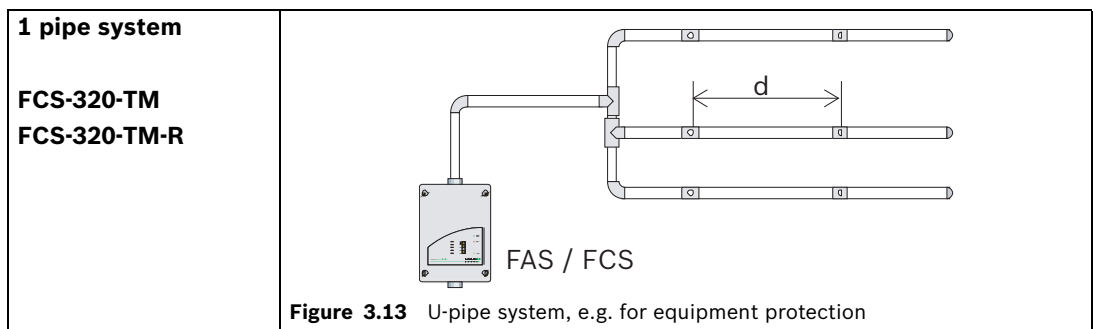


Limiting values	Min. distance FCS-320-TM – T-fitting	2 m
	Max. distance FCS-320-TM – T-fitting	20 m
	Max. branch length	25 m
	Max. total pipe length per pipe system	
	– Pipe Ø 25 mm	50 m
	– Additional pipe Ø 12 mm	8 x 3 m
	Max. total pipe length per pipe system for a fan voltage < 10.5 V	
	– Pipe Ø 25 mm	40 m
	– Additional pipe Ø 12 mm	8 x 3 m
Max. number of air sampling openings (n) per pipe system	8 units	
Min. distance between 2 air sampling openings	0.1 m	
Max. distance between 2 air sampling openings	4 m	

U-pipe system	Number of air sampling openings			
	2	4	6	8
Ø of all air sampling openings in mm^a	6.0	4.2	3.4	3.0

^a Punch diameter of the aspiration reducing film sheet

3.8.3 M-pipe system - simplified planning

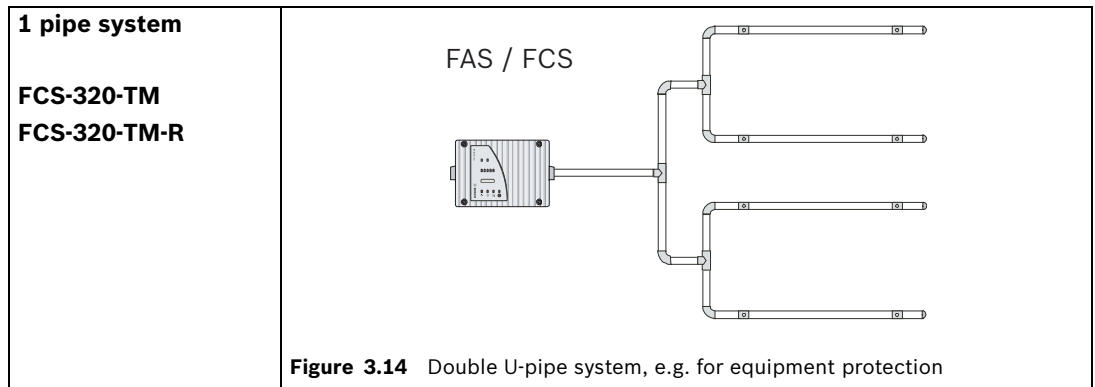


Limiting values	Min. distance FCS-320-TM – T-fitting	2 m
	Max. distance FCS-320-TM – T-fitting	20 m
	Max. branch length	16.5 m
	Max. total pipe length per pipe system	
	– Pipe Ø 25 mm	50 m
	– Additional pipe Ø 12 mm	8 x 3 m
	Max. total pipe length per pipe system for a fan voltage < 10.5 V	
	– Pipe Ø 25 mm	40 m
	– Additional pipe Ø 12 mm	8 x 3 m
Max. number of air sampling openings (n) per pipe system	6 units	
Min. distance between 2 air sampling openings	0.1 m	
Max. distance between 2 air sampling openings	4 m	

M-pipe system	Number of air sampling openings	
	3	6
Ø of all air sampling openings in mm^a	5.0	3.6
^a Punch diameter of the aspiration reducing film sheet		

3.8.4

Double U-Pipe System - Simplified Planning



Limiting values	Min. distance FCS-320-TM – last T-fitting	2 m
	Max. distance FCS-320-TM – last T-fitting	20 m
	Max. branch length	12.5 m
	Max. total pipe length per pipe system	
	– Pipe Ø 25 mm	50 m
	– Additional pipe Ø 12 mm	8 x 3 m
	Max. total pipe length per pipe system for a fan voltage < 10.5 V	
	– Pipe Ø 25 mm	40 m
	– Additional pipe Ø 12 mm	8 x 3 m
Max. number of air sampling openings (n) per pipe system	8 units	
Min. distance between 2 air sampling openings	0.1 m	
Max. distance between 2 air sampling openings	4 m	

Double U-pipe system	Number of air sampling openings	
	4	8
Ø of air sampling openings in mm ^a	4.4	3.0
^a Punch diameter of the aspiration reducing film sheet		

3.9

Planning for Forced Airflow

Monitoring the air-conditioning ducts

Air-conditioning units are broken down into low and high-speed units (see table below). The details provided in this chapter apply only to low-speed units. There are no adequate empirical values available for high-speed units. Hence, smoke trials must be executed for air-conditioning ducts with flow speeds above 10 m/s, in order to determine optimal response behavior.

Air-conditioning ducts		Low-speed units	High-speed units
	Flow speed	Maximum 6 to 10 m/s	> 10 m/s
	Duct cross-section	Large	Small
	Difference pressures along the flow direction	Low	Large

The speed distribution in an air-conditioning duct appears as follows:

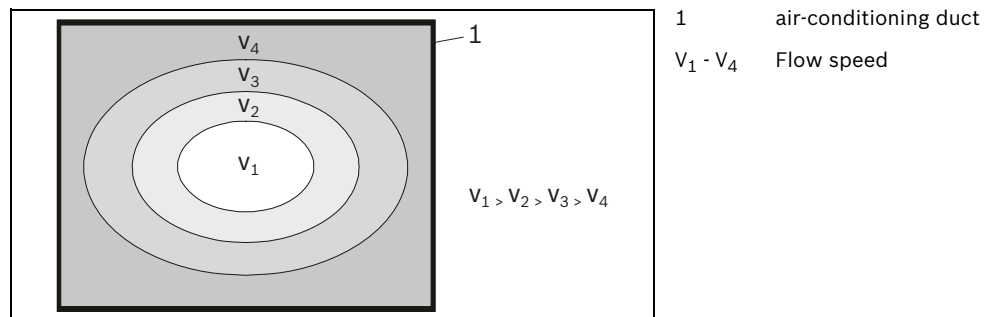


Figure 3.15 Speed distribution in an air-conditioning duct

Aspiration

To achieve optimal detection results, the pipe system should be organized into the areas v_1 to v_3

Installation location of the pipe system

The exhaust duct should be selected as the installation location of the pipe system, as far as possible away from the sound dampers, air baffles and bends. The distance from obstacles of this kind should be at least three times the smallest duct diameter.

If it is absolutely essential to install the pipe system directly behind air baffles, sound dampers or bends; the main speed ranges must be monitored (see *Figure 3.16*/*Figure 3.17*).

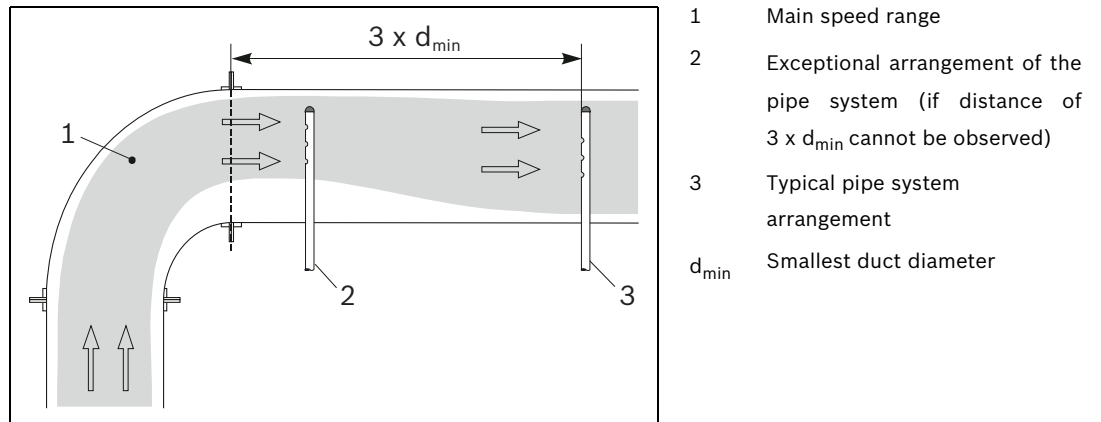


Figure 3.16 Direction change of the duct without air baffles

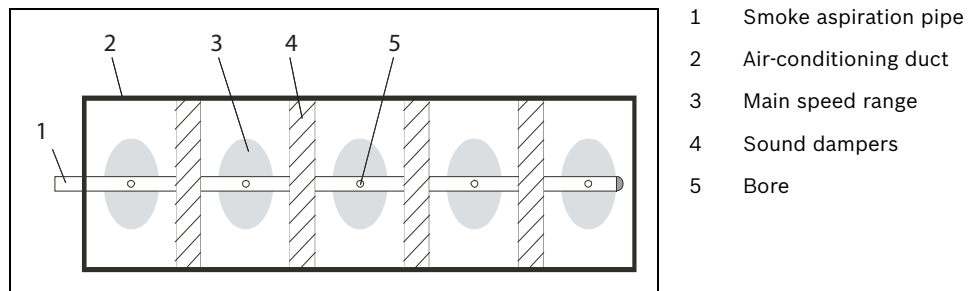


Figure 3.17 Sound dampers in a duct

When installing a pipe system in air-conditioning ducts, the following must be observed:

- Since the FCS-320-TM and the pipe system are located in different pressure ranges, an air return pipe (see *Figure 3.18*) must be provided.
- The pipe entries into the duct must be airtight.
- The portion of the pipe system that is outside the duct must be sealed airtight.

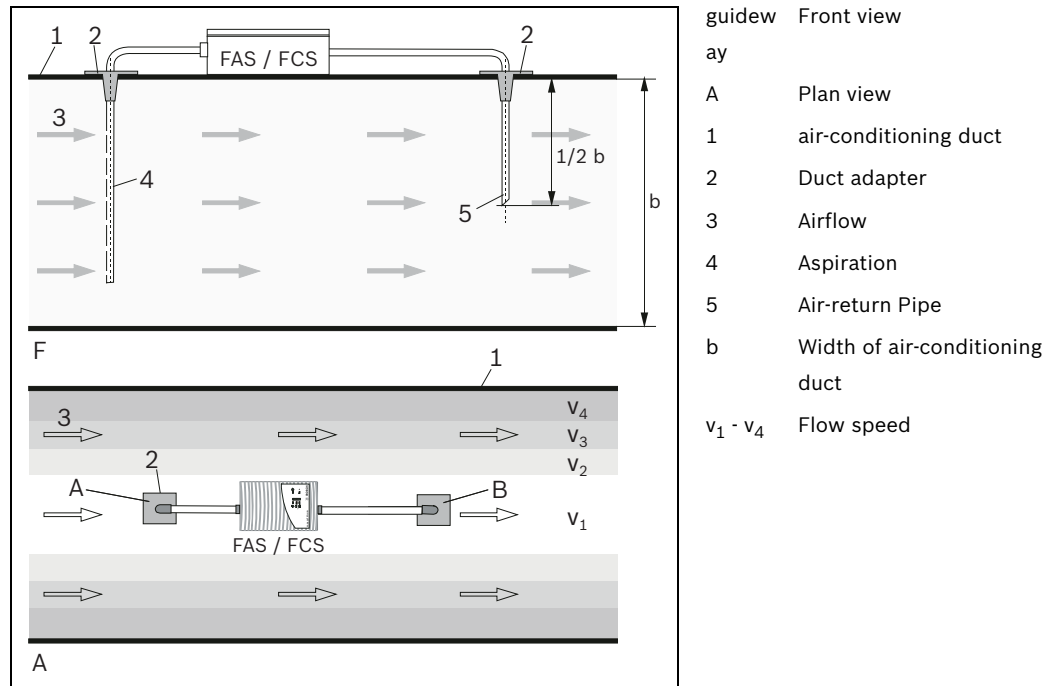


Figure 3.18 Air-return Pipe

The open end of the air-return pipe is sloped at an angle of 45° (see *Figure 5.5, Page 71*). The distance of the air sampling openings to one another and to the duct wall is represented in the following table.

Bore distances	Duct cross-section	
	≤ 0.5 m ²	≤ 0.5 m ²
Distance of the air sampling openings to the wall	100 to 200mm	200 to 300 mm
Distance of the air sampling openings to one another	100 mm	150 mm

Diameter of the air sampling openings

The diameter of the air sampling openings is derived from the number of air sampling openings. The precise value can be obtained from *Section 3.8 Simplified Pipe Planning*. The pipe is closed with an end cap without bore hole.

Arrangement

The air sampling openings must face the airflow.

Note when planning that the air-conditioning ducts are often only accessible from two sides for installation of the pipe system.

Example

Figure 3.19 shows two planning examples of pipe systems in air-conditioning ducts.

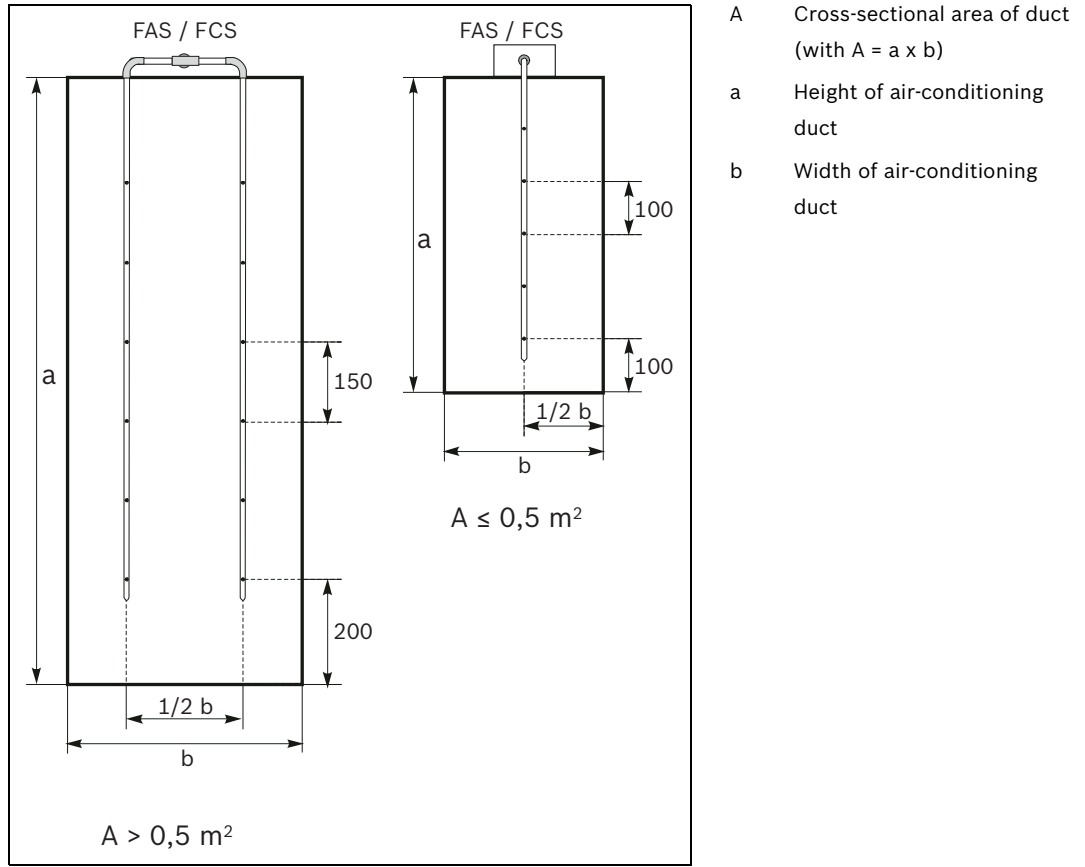


Figure 3.19 Ducts with small and large duct cross-sections

3.10 Power Supply

To measure the power supply, the detector-ready state of the security system and the alarm case are regarded. When the system is ready to detect, the power supply must provide the standby current for the aspirating smoke detectors and ensure the emergency power rechargeable battery is charged in accordance with DIN VDE 0833, part 1 (80% charged in 24 hrs).

The current in the event of an alarm is calculated according to the following formula:

Calculation of current for space protection

$$I_g = I_A \cdot n_{max} + I_Q \cdot (n - n_{max}) \leq I_{PSmax}$$

Equipment protection

$$I_g = I_A \cdot \sqrt{n} + I_Q \cdot (n - \sqrt{n}) \leq I_{PSmax}$$

Charging current

The power for charging the rechargeable battery is calculated with the following formula:

$$I_L = \frac{0,8 \cdot K_n}{24}$$

$$I_g = I_Q \cdot n + I_L \leq I_{PSmax}$$

where

I_g	=	Total current of all connected aspirating smoke detectors in [A]
I_A	=	Alarm current of an aspirating smoke detector in [A]
I_Q	=	Standby current of an aspirating smoke detector in [A]
I_{PSmax}	=	Max. power supply of the network power supply in [A]
I_L	=	Charging current of the rechargeable batteries (80% of the nominal capacity within 24 hours) in [A]
K_n	=	Rated capacity of the rechargeable battery in [Ah]
n	=	Total number of connected aspirating smoke detectors
n_{max}	=	The highest number of aspirating smoke detectors in one detection zone



NOTICE!

The power supply units are laid out using the calculated total current I_g with the highest value.

Please refer to *Section 2.8 Technical data, page 28* for the current consumption of the FCS-320-TM.

Line calculation

The maximum line length is derived from the permissible voltage drop on the supply line. The permissible voltage drop is the difference between the end-point voltage of the backup battery (21.5 V) and the lower operating voltage limits of the aspirating smoke detectors.

$$L_{max} = \frac{\gamma \cdot \Delta U \cdot A}{I_g \cdot 2}$$

where

L_{max}	=	Maximum line length in [m]
A	=	Strand cross-section in [mm ²]
I_g	=	Total current of all connected aspirating smoke detectors in [A]
γ	=	Conductivity: Cu=57 m/Ω mm ²
ΔU	=	Charging current of the rechargeable batteries (80% of the nominal capacity within 24 hours) in [A]

To guarantee the impermeability of the housing, the corresponding cable bushing must be selected for the existing cable:

- M 25 cable bushing: Ø 9-14 mm
- M 20 cable bushing: Ø 8-12 mm

Emergency power calculation

The rated capacity is calculated according to the following formula:

$$K_n = (I_Q \cdot n \cdot t + I_g \cdot 0,5h) \cdot 1,25$$

K_n	=	Rated capacity of the backup batteries in [Ah]
I_Q	=	Standby current of an aspirating smoke detector in [A]
n	=	Total number of connected aspirating smoke detectors
t	=	Required bridging time in [hrs]
I_g	=	Total current of all connected aspirating smoke detectors in [A]

The factor 1.25 used in the formula is only applicable with bridging times ≤24 hours.

4 Installing the Aspirating Smoke Detector

4.1 General

The regulations, guidelines and provisions described in *Section 3.1 Regulations, page 31* apply. The following must be observed when installing the FCS-320-TM Aspirating Smoke Detector:

1. Do not interfere with, modify or convert the equipment. If adjustments cannot be avoided, consult with the operator, the unit manufacturer and/or the supply company.
2. All changes to the house mains (230 V/400 V supply) and to third-party systems must be executed by the builder. This includes e.g.
 - Primary connection of the mains charger
 - Carrying out any potentially essential lightning and surge protection measures in compliance with relevant standards



WARNING!

The equipment may only be installed by authorized and qualified personnel! Switch off the unit before carrying out any connection work!

4.2 Installing the Unit



NOTICE!

- When selecting the installation location, ensure that the unit displays are easily visible.
- Remember when planning that the unit fans generate a noise level of approx. 40 dB(A).
- In order to prevent damage to the device, ensure that the installation location is not in a door opening area.

The aspirating smoke detector can be installed with the aspiration device pointing upwards or downwards. Turn the detector module in the cover by 180° as applicable.

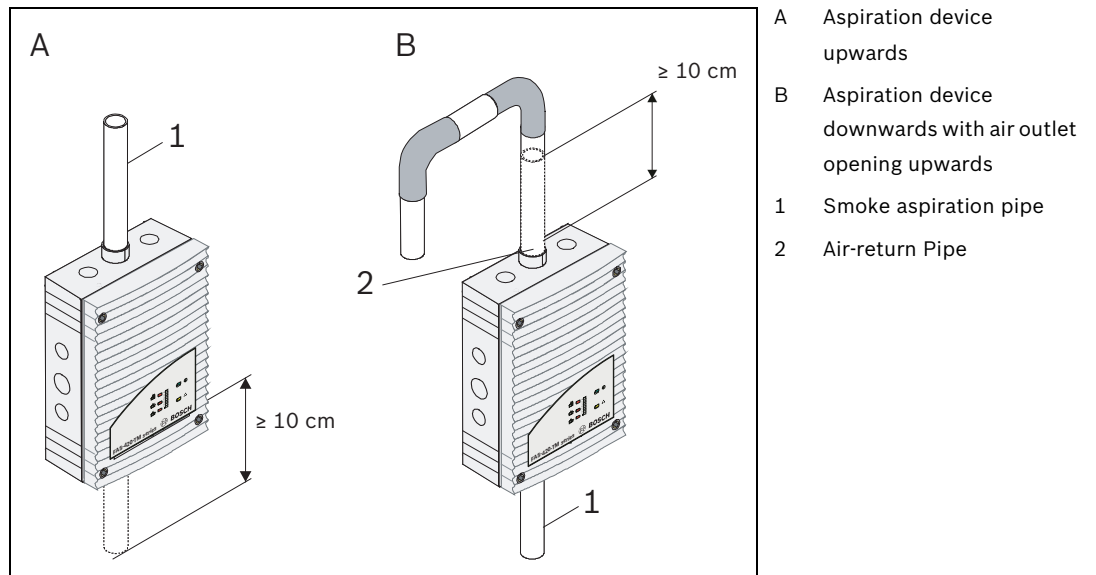


Figure 4.1 Installation of the FCS-320-TM

Aspiration from above

Ensure that the air outlet of the aspirating smoke detector is not obstructed. Maintain a distance of at least 10 cm between the air outlet of the FCS-320-TM and the surrounding objects (e.g. wall).

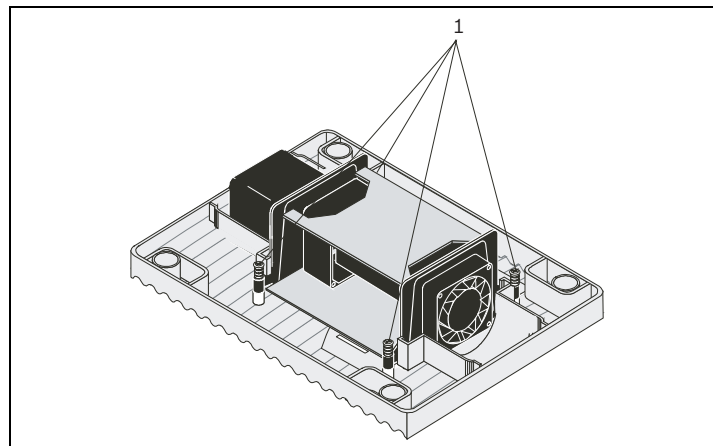
Aspiration from below

If the air-return pipe is directed upwards, it must be guaranteed that no foreign bodies or dripping water can penetrate the air return. You should therefore use a short, downward angled pipe (see *Figure 4.1*).

Turning the detector module in the cover

In order to turn the detector module in the cover of the FCS-320-TM detection unit by 180°, proceed as follows:

1. Remove the four screws (see *Figure 4.2* for positions).
2. Now turn the cover and fasten the detector module again with the four screws.



1 Screws

Figure 4.2 Turning the detector module in the cover of the FCS-320-TM detection unit

Installation material

Cylinder or flat head screws

- | |
|---------------------------------|
| – Maximum thread diameter: 4 mm |
| – Head diameter: max. 8 mm |

Bore distances

The distances of the borings for securing the FCS-320-TM are shown in *Figure 4.3*.

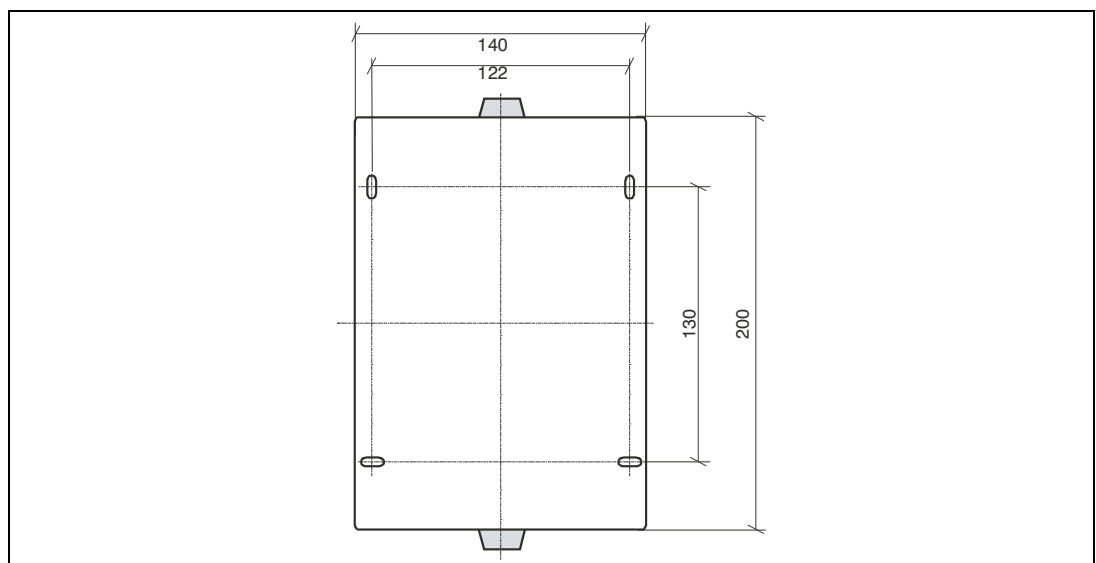
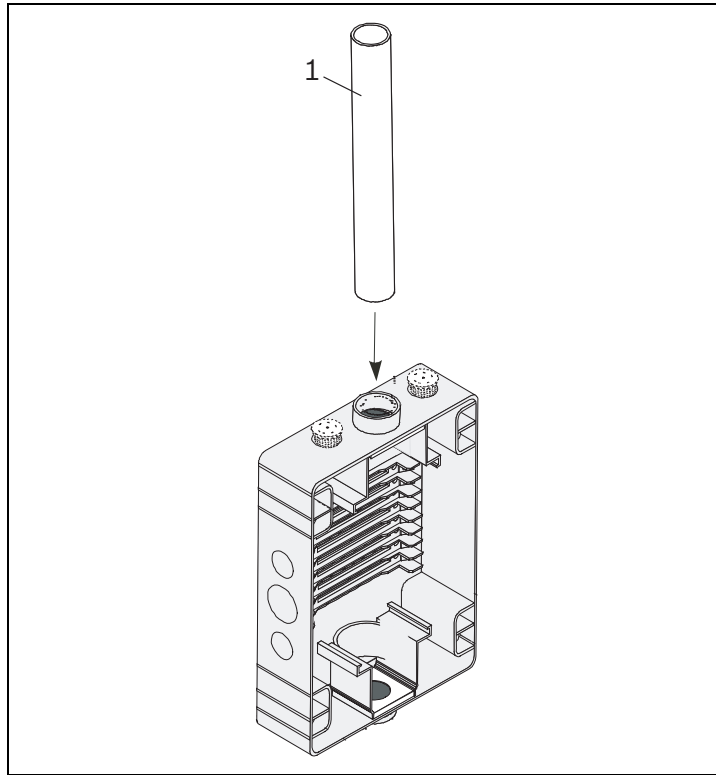


Figure 4.3 Bore distances of FCS-320-TM's housing base

installation

1. First, clearly mark the fixing points on the installation position provided on the equipment. To guarantee a safe and low-vibration hold, the housing base must be secured with four screws.
2. Fix the housing base to the surface by means of four screws in accordance with the mounting type. Make sure that the housing base is not fixed under mechanical tension and that the screws are not tightened too much. Otherwise, the device might be damaged or undesirable secondary noise may arise.



1 Smoke aspiration pipe

Figure 4.4 Connecting the aspiration pipe to the FCS-320-TM Aspirating Smoke Detector

3. To connect the aspiration pipe to the FCS-320-TM, insert it into the pipe connection provided (see *Figure 4.4*).

NOTICE!



- Do not use glue to connect the aspiration pipe and pipe connection.
- In the event of sharp temperature fluctuations, the pipe must be fixed immediately in front of the unit so that the pipe does not pull out of the pipe connection when the length changes (see *Section 5.1 Length Change of the Pipe System, page 67*).

4. Insert the detection unit into the pre-mounted housing base. When doing this, be aware of the mechanical coding, which protects the device against twisting. Tighten the four screws of the detection unit using a screwdriver (see *Figure 4.5*).



CAUTION!

The components on the PC boards must be protected against damage from electrostatic charging.

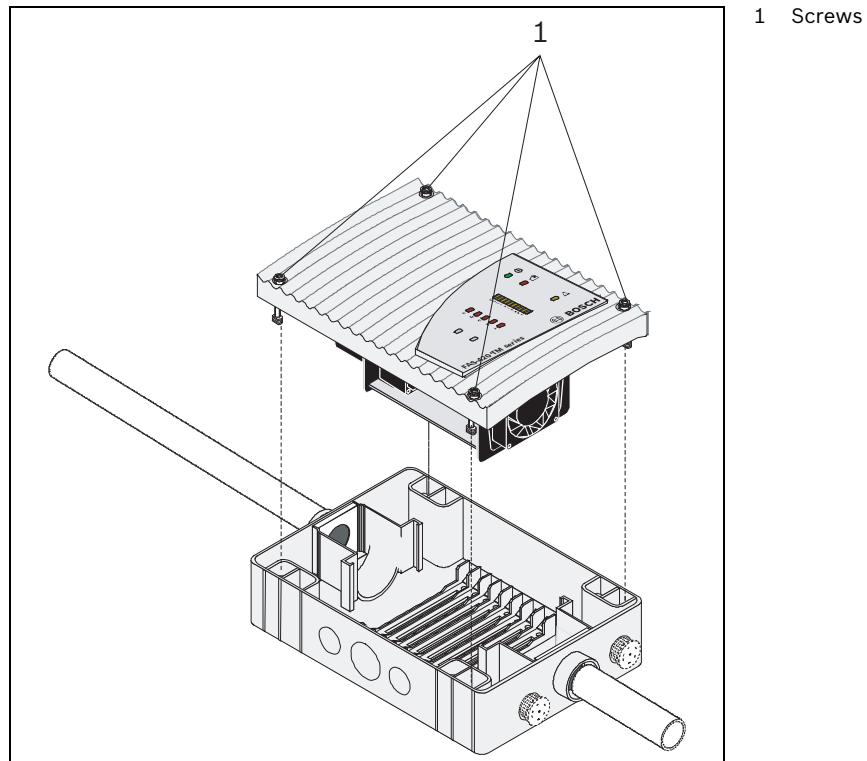


Figure 4.5 Inserting the detection unit of the FCS-320-TM

4.3 Connection to the Fire Panel

4.3.1 Electrical Connection

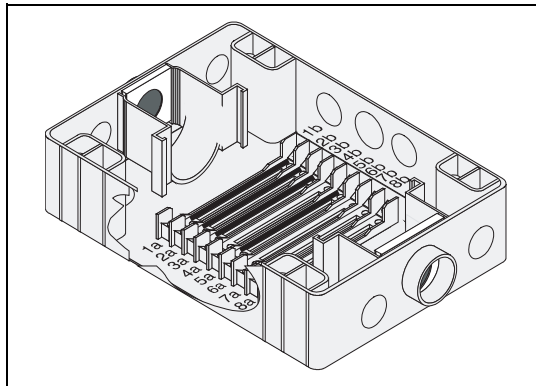


CAUTION!

Switch off the unit before carrying out any connection work!

Proceed as follows to prepare the electrical connections:

1. Using a screwdriver, carefully punch out the required cable entries from the housing base.
2. Fit the cable entry point(s) as required with M20 or M25 cable entries by pushing them into the corresponding cable bushings. 2 x M20 and 1 x M25 cable entries are supplied in the pack.
3. Punch out the cable entries using a sharp object.
Caution: Do not cut the cable entries with a knife!
4. Feed the connection cable(s) (max. 2.5 mm²) through the prepared M20 or M25 cable entries into the device and cut to the required length inside the device.
5. Wire the unit according to the connection information described below (see *Table 4.1*).



Designation	Cable	Function
V+	Red	Additional power supply, incoming
V-	Black	
V+	Red	Additional power supply, outgoing
V-	Black	
Alarm		Conventional, incoming
Tamper	-	Fault relay
Reset+		Connection for resetting the detector
Reset-		
Data+	-	Data line connection for digital remote indicator*
Data-	-	

*Digital remote indicators for the FCS-320-TM series must be ordered separately.

Table 4.1 Assignment of screw terminals in the housing base



NOTICE!

Refer to the sticker in the housing for details on the assignment of screw terminals.

4.4 Installation and electrical connection of auxiliary modules

4.4.1 Installing the reset board

The reset board is optionally available for use with the FCS-320-TM series. The reset board is installed in an appropriate additional housing. If several FCS-320-TMs are connected to one detector line, the reset board is installed in the detector line after the last FCS-320-TM unit. The reset board electrically connected in accordance with the wiring diagram (see Fig. 5.10).



NOTICE!

The reset board can be used only if the standby current of the detector line is between 5 mA and 50 mA and the detector line terminates with a resistor. The reset pulse is triggered whenever the line voltage drops below 3 V when resetting the panel.

Standby current of the line

Calculate the standby current I_R of the line as follows:

$$I_R = \frac{U_L}{R_E}$$

where

R_E = original terminal resistance of the line [Ohm]

U_L = Line voltage [V]

I_R = Standby current of the line [A]

The equations used to calculate the terminal resistance and the standby current of the detector line are based on an ideal condition for signal evaluation.

If acknowledgement does not take place with the calculated terminal resistance for the relay board, reduce the value of the terminal resistance by approx. 20%.

Terminal resistance

The reset board simulates the detector line terminal resistance. It is calculated anew and installed on the reset board (Terminal X1). Calculate the value of the terminal resistance R_{ER} as follows:

$$R_{ER} = \frac{(U_L - 2,7 \text{ V})}{I_R}$$

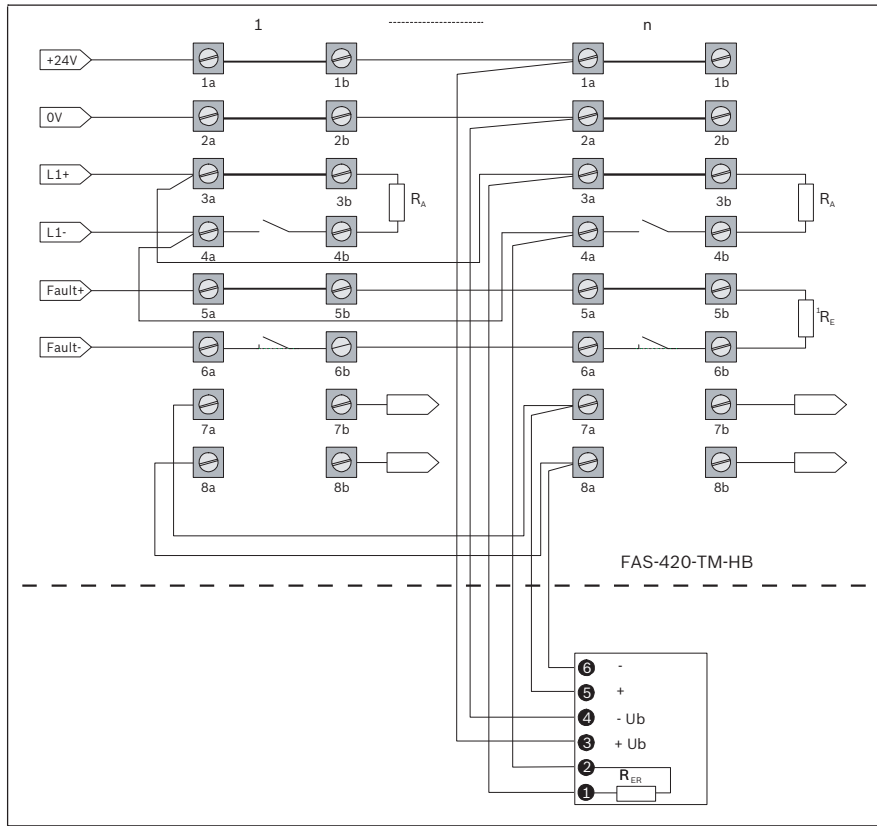
where

R_{ER} = Terminal resistance on the reset board [Ohms]

U_L = Line voltage [V]

I_R = Standby current of the line [A]

4.4.2 Connection to fire panel with reset board



4.4.3 Installation of the relay board

If a relay board is needed, it must be installed in an additional housing.



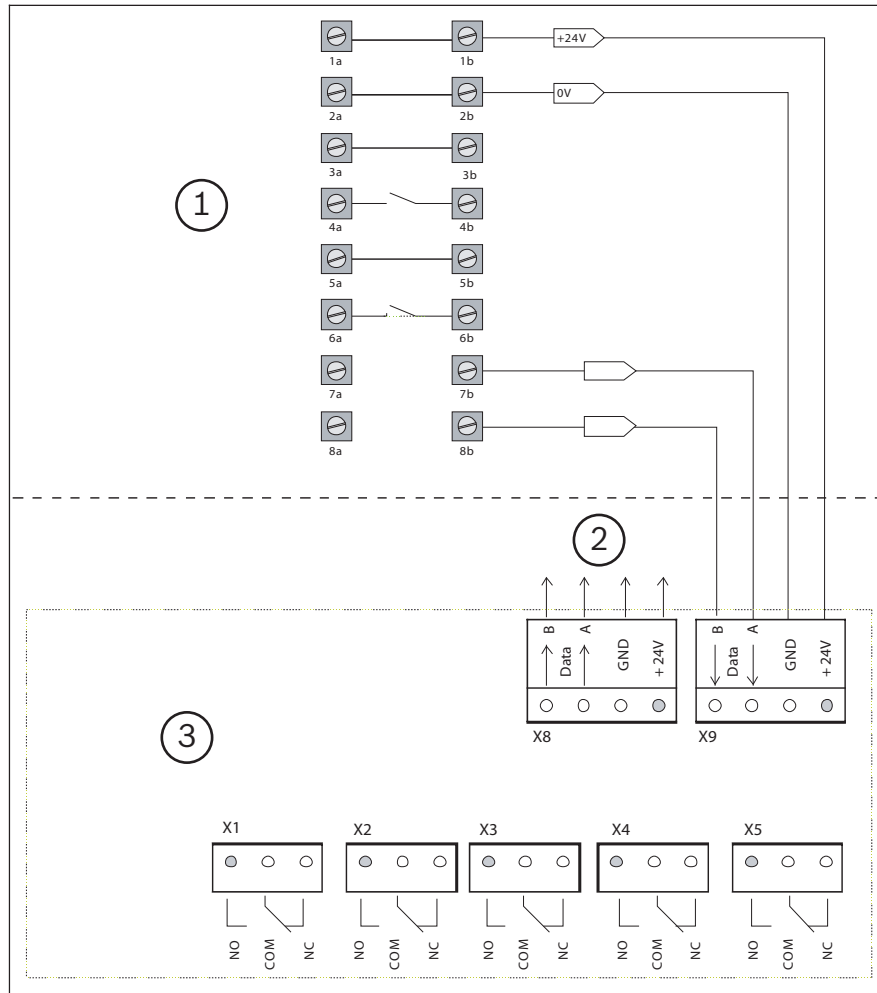
NOTICE!

An additional housing is needed for each relay board. A maximum of 2 relay boards or remote indicators can be connected to a unit. Please use only a suitable housing.

You can connect up to 5 remote indicators per relay board via relays X1 to X5 on the relay board. These are actuated by the ROOM·IDENT function.

After the relay board has been installed and the remote indicators connected, you can test them using the FAS-ASD-DIAG Diagnostic Software.

4.4.4 Connecting the relay board



- 1 FCS-320-TM-HB
- 2 To next board
- 3 Relay board

4.5 Settings via the FAS-ASD-DIAG Diagnostic Software

fire source identification



NOTICE!

The term "ROOM-IDENT" is used in the FAS-ASD-DIAG Diagnostic Software for the identification of the fire source.

Fire source identification is activated/deactivated using the FAS-ASD-DIAG Diagnostic Software via the "Settings" screen. The "ROOMIDENT" function is deactivated as standard.

4.5.1 Setting the Response Sensitivity

The sensitivity of the detection unit can be adjusted via FAS-ASD-DIAG.

	Sensitivity	Standard sensitivity	Setting intervals
Detection unit	0.5-2%/m	0.5 %/m	0.1 %/m

4.5.2 Delay Time of the Alarm Triggering

The default delay time for the alarm threshold can be changed via the diagnostic software. The default delay time for the alarm is set to 10 s. If the smoke level increases during operation until it reaches the alarm threshold, the delay time starts to count down. The message is transmitted only after the delay time has expired and the smoke level remains at its current level. In this way, deceptive alarms due to brief strains (e.g. dust) can be prevented.

	Alarm delay	Alarm delay (default)	Setting intervals
Detection unit	0 s - 60 s	10 s	1 s



NOTICE!

The alarm delay time should be set to 0 seconds for test purposes only.

4.5.3 Activation threshold of the airflow monitoring

The activation threshold for an airflow problem can be changed for the detection unit via the FAS-ASD-DIAG.

	Activation threshold	Activation threshold (default)	Setting intervals
Detection unit	10% - 50%	20%	1 %

Select the activation threshold in line with *Section 3 Planning, page 31*.

4.5.4 Delay time for an airflow malfunction

If you wish to change the delay time for transmitting the signal for an airflow malfunction, this is possible via the FAS-ASD-DIAG.

	Fault delay	Fault delay (default)	Setting intervals
Detection unit	1 s - 60 min	100 s	1 s

The default delay time is set to 100 seconds. In areas with time-limited disturbance variables (e.g. air pressure fluctuations), other delay times should be set based on the duration of the disturbance variables.

4.5.5 Fault Indication

The collective fault display (airflow and detection unit malfunction) can be set to log or not to log (default) trouble messages. Activation or deactivation is possible via the diagnostic software.

	Log trouble	Do not save trouble messages (default)
Detection unit	off - on	off

4.5.6 Dynamic airflow

Activation or deactivation of dynamic airflow is possible via the diagnostic software.

	Dynamic airflow	Dynamic airflow (default)
Detection unit	off - on	off

4.5.7 ROOM·IDENT

Activation or deactivation of fire source identification is possible via the diagnostic software.

	ROOM-IDENT	ROOM-IDENT (default)
Detection unit	off - on	off

4.5.8

LOGIC-SENS

The LOGIC-SENS intelligent signal processing feature can be activated or deactivated via the diagnostic software. If the signal evaluation is switched on, LOGIC-SENS recognizes briefly occurring disturbance variables and can thus prevent a deceptive alarm.

	LOGIC-SENS	LOGIC-SENS (default)
Detection unit	off - on	off

4.5.9

Setting the Fan Voltage

The standard setting fan voltage setting is 9 V. In critical applications, the fan voltage can be set to a higher level via the diagnostic software. This increases the transport speed in the pipe system, thus achieving faster detection in the case of longer pipe lengths.

With a fan voltage of 9 V to 10.4 V, the maximum pipe lengths are reduced to 30 m for I-pipe systems or 40 m for U and double U-pipe systems. A fan voltage of 10.5 V or higher supports the maximum pipe length.

	Fan voltage	Fan voltage (default)	Setting intervals
Detection unit	9 V-13.5 V	9 V	0.1 V



CAUTION!

Whenever the fan voltage is changed, the FCS-320-TM automatically performs an airflow initialization.

4.5.10

Entering the current air pressure

The current air pressure in the monitoring range must be entered via the diagnostic software if air-pressure-dependent calibration is required.

The default setting is 1013 hPa. This corresponds to the average air pressure at sea level.

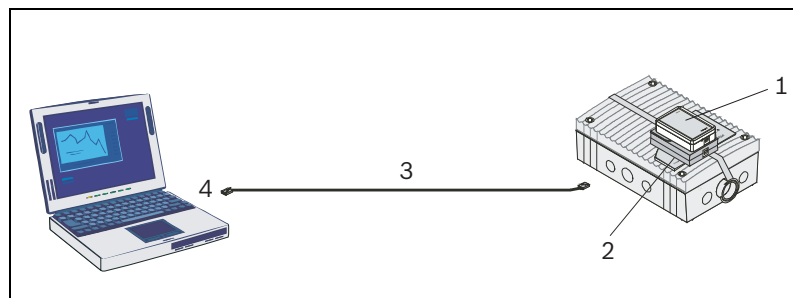
4.5.11

Entering the height above sea level

The value of the height above sea level is that of the location where the FCS-320-TM is installed. This value is entered via the diagnostic software. The standard deviation is 0 m. If the airflow sensor in the unit requires air-pressure-dependent calibration, it is necessary to change this value.

4.6

Data Logging



- 1 FAS-ASD-DIAG
- 2 infrared port
- 3 USB connection cable
- 4 USB port

Figure 4.6 Connecting a PC to the FCS-320-TM

The FAS-ASD-DIAG Diagnostic Software is used to conduct the device tests.

The current airflow sensor data, smoke level values, various status values and the parameters configured via the programming software can be read out locally using a laptop. This makes it much easier to detect altered operation conditions in the event of service being carried out. The data is read out to the diagnostic appliance via the infrared port of the FCS-320-TM. The diagnostic appliance can be secured to the aspirating smoke detector with a unit mounting or be kept in a straight line ($\pm 10^\circ$) with the infrared port at a distance of up to 3 m. The supplied USB cable connects the diagnostic appliance to the USB port of the PC/laptop (see *Figure 4.6*).

The data that is read out is stored in the appliance for 72 hours for diagnostic purposes. Windows 2000 (with the latest service pack) or Windows XP can be used as the operating system.

**NOTICE!**

For correct color display, the monitor used and the graphics card must be able to display more than 256 colors.

5 Installation of the Pipe System

At the very least, the pipes and fittings used for the pipe system must comply with class 1131 according to EN 61386-1, 2004. Class 1131 requires the following of the pipe system in use:

Features	Severity
Compression resistance	125 N
Shock resistance	0.5 kg, drop height of 100 mm
Temperature range	-15 °C to +60 °C

The pipe system must be constructed using the following pipes and the associated fittings:

	Exterior diameter	Internal diameter	
		ABS	PVC*
Smoke aspiration pipe	25 mm	21.4 mm	21.2 mm

* PVC pipes do not correspond to the temperature range given above.



NOTICE!

When constructing the pipe system, observe the temperature range specified in *Section 2.8.2 Pipe System, page 29*.

Installation instructions

The pipe system must be constructed according to planning specifications and taking into account the planning guidelines (see *Section 3 Planning, page 31*).

1. Shorten the pipes with a pipe-cutter (38 mm) or a metal saw. Deburr the joints and clean up the chips.
2. Before gluing, clean the adhesion points with the prescribed cleaning agent (Tangit) to remove dirt and grease. Use the Tangit adhesive to glue the pipe transitions with the appropriate fittings so that they are airtight.



NOTICE!

If halogen-free plastics must be used, the installation procedures may vary depending on the selected material:

- ABS is glued
- Polypropylene (PP) is welded
- Polyamide (PA) is pushed together and bolted.

3. Minimize pipe lengths and changes of direction. Pipe elbows have an extremely high flow resistance. Therefore, they should only be used where they cannot be avoided for structural engineering reasons. If necessary, reduce pipe lengths in proportion to the pipe elbows used.



NOTICE!

Pipe bends must be given preference over pipe elbows. Too many bends and pipe elbows reduce the air speed in the aspiration pipe, thereby increasing the detection time.

As a benchmark, a pipe bend corresponds to a straight pipe length of 0.3 m. An elbow corresponds to a straight pipe length of 1.5 m.

4. Fix the pipe system. It must not sag or be possible to move it. Fasten the pipes with pipe clips without rubber inserts. The distance between the pipe clips should not exceed 80 cm. At high temperatures, reduce the distance between the pipe clips to a maximum of 30 cm.



NOTICE!

Do not use pipe clips with rubber inserts since these do not allow length extensions and the pipe system could thus bend or even tear.

5. Close open pipe ends with an end cap.



NOTICE!

On completion, test the pipe system:

- For tightness
- For fault-free connections
- For correct planning of the air sampling openings.

5.1

Length Change of the Pipe System

Length changes (extensions and reductions) of the pipes are caused by temperature changes. Temperature increases cause lengthening of the pipes, temperature drops cause shortening of the pipes. The length change must be given particular consideration if the temperature of the pipe system at the time of installation deviates from the normal operating temperature. The length change can be calculated using the following formula:

$$\Delta L = L \cdot \Delta T \cdot \delta$$

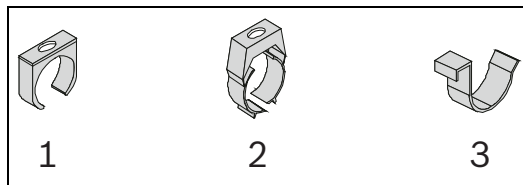
where

- ΔL = Length change in [mm]
- L = Length of the pipe to be calculated in [m]
- ΔT = Maximum temperature difference in [°C]
- δ_{PVC} = 0.08 mm/m x °C
- δ_{ABS} = 0.101 mm/m x °C

For example, a temperature change of 10 °C on a 10 m-long PVC pipe causes a length change of 8 mm.

Mounting clamps

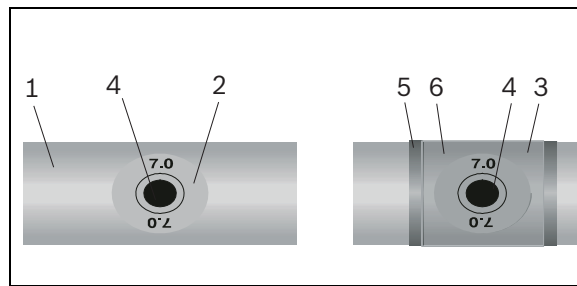
PVC pipe clips are used as standard for installing the pipe system. These clips do not allow any length extensions.



- 1 Standard mounting clamps for 25 mm pipe
- 2 Plastic mounting clamps for 25 mm pipe, for length changes and temperatures of up to -40 °C
- 3 Spring steel clamp for 25 mm pipe, for high-rise warehouses and temperatures of up to -40 °C

Figure 5.1 Overview of mounting clamps

5.2 Air sampling openings



- 1 Smoke aspiration pipe
- 2 Aspiration reducing film sheet with air sampling opening
- 3 Marking tape for aspiration reducing film sheet
- 4 Air sampling opening
- 5 Fire red (RAL 3000)
- 6 Transparent

Figure 5.2 Example of an aspiration boring with aspiration reducing film sheet

Air sampling openings

Select the structure of the air sampling opening (aspiration boring) and the position in the pipe system according to the project specification and taking into account the planning guidelines.

Aspiration borings

1. Bore an aspiration boring with a 10 mm drill at a right angle to the pipe. Deburr the boring carefully and remove chips.
Clean the boring area (across the entire span of the pipe) of grease and dust, e.g. with Tangit cleaning agent.
2. Select the size of the aspiration reducing film sheet according to the specifications. Glue the aspiration reducing film sheet to the opening (see *Figure 5.3*).
3. Glue the marking tape over the aspiration reducing film sheet, in order to prevent the film sheet from becoming detached.

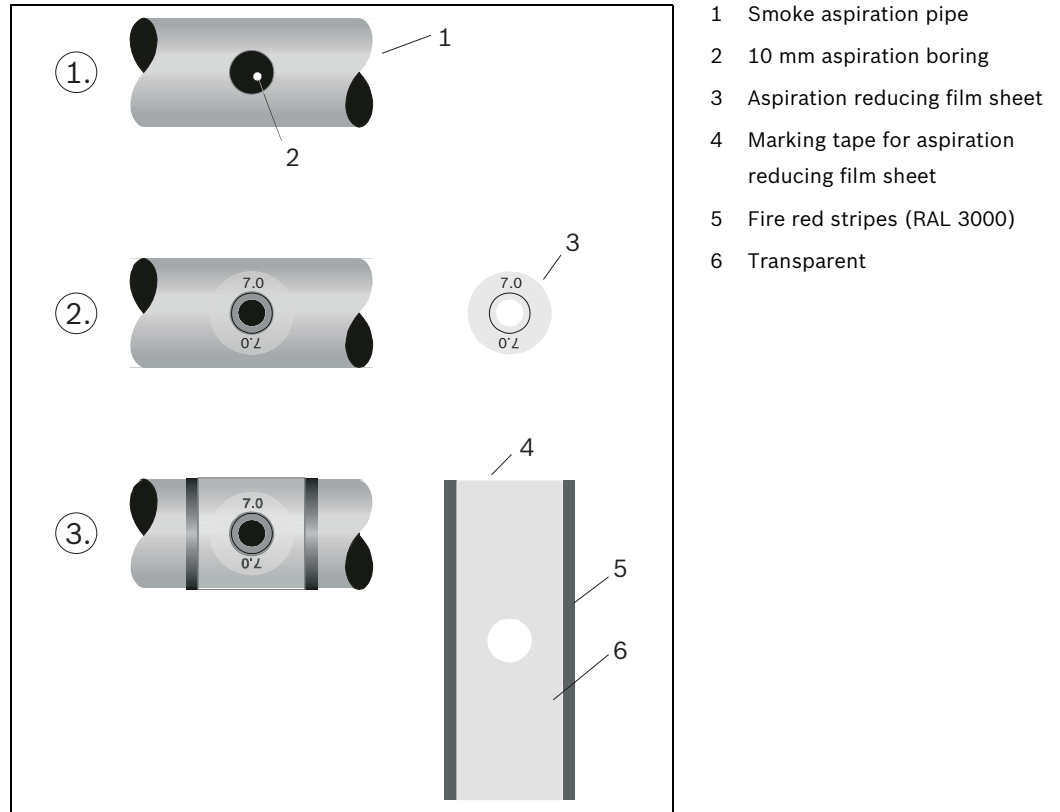


Figure 5.3 Applying the aspiration reducing film sheet

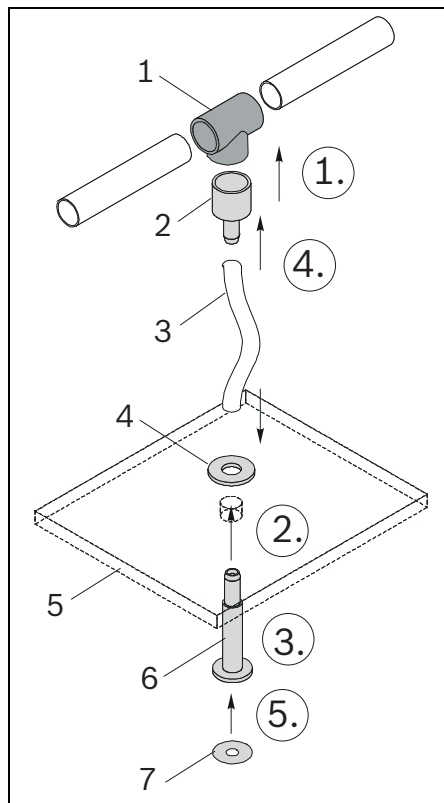


NOTICE!

The holes of the aspiration reducing film sheet and the marking tape must be exactly over the aspiration boring so that the opening diameter of the aspiration reducing film sheet is not changed.

To keep the adhesive surfaces of the film sheets free of dust and grease, avoid touching them.

5.3 Ceiling Lead-through Adapter



- 1 T-fitting
- 2 Hose connection for ceiling lead-through
- 3 Aspiration hose for ceiling lead-through
- 4 Ceiling lead-through nut
- 5 false ceiling
- 6 Ceiling lead-through (part)
- 7 Aspiration reducing film sheet

The following steps are essential for installing a ceiling lead-through:

1. Before gluing, clean the adhesion points with the prescribed cleaning agent to remove dirt and grease. Glue the hose connection to the relevant T-fitting on the aspiration pipe using Tangit adhesive.
2. Drill a 13 mm \varnothing hole in the false ceiling for each ceiling lead-through.
3. Install the ceiling lead-through by removing the nut, pushing the part with the hose nozzle through the bore from below, then refitting and tightening the nut above the false ceiling.
4. Determine the required aspiration hose and cut to length. Place the cut end of the hose onto the hose nozzle in the ceiling lead-through and onto the hose connection on the aspiration pipe T-fitting. If necessary, heat up the hose using a hot air blower.
5. Glue the required aspiration reducing film sheet (as per the planning guidelines) onto the ceiling lead-through.



NOTICE!

The hole in the aspiration reducing film sheet must be positioned exactly over the opening in the ceiling lead-through. The opening diameter in the aspiration reducing film sheet must not be altered.

To keep the adhesive surfaces of the film sheets free of dust and grease, avoid touching them.

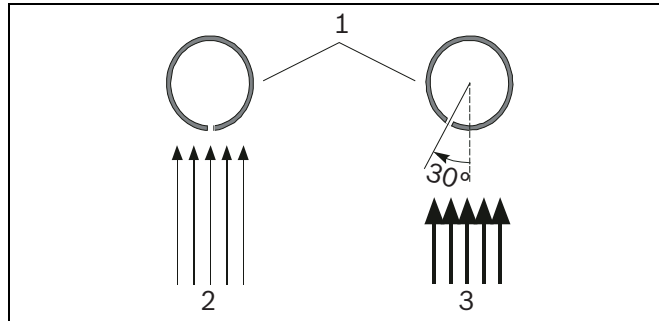
5.4 Monitoring with Forced Airflow

5.4.1 Detection at Intake and Exhaust Openings



CAUTION!

If the smoke aspiration occurs in a forced airflow (fan, air-conditioning units), direct the air sampling openings depending on the exhaust speed in the airflow (see *Figure 5.4*).

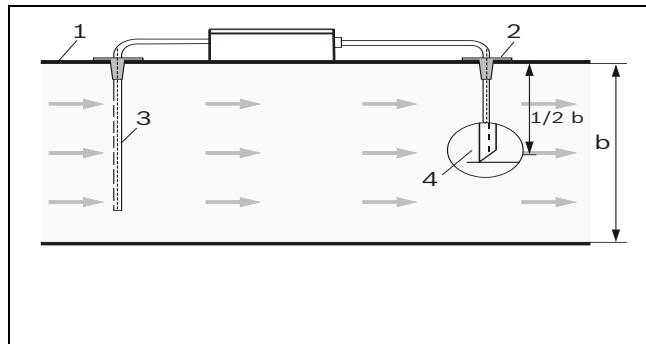


- 1 Aspiration pipe with air sampling openings
- 2 Exhaust speed $< 0.5 \text{ m/s}$
- 3 Exhaust speed $> 0.5 \text{ m/s}$

Figure 5.4 Positioning the air sampling opening depending on air speed

5.4.2 Detection in the Bypass

For details on connecting the air return, please see *Section 5.6 Air-return Pipe, page 72*.



- 1 air-conditioning duct
- 2 Duct adapter
- 3 Aspiration
- 4 Air-return Pipe
- b Width of air-conditioning duct

Figure 5.5 Positioning the air return – example of an air-conditioning duct (bypass)

For FCS-320-TM planning in these applications, see *Section 3.9 Planning for Forced Airflow, page 50*.

5.5 Air filter

5.5.1 Installing the Air Filter Box

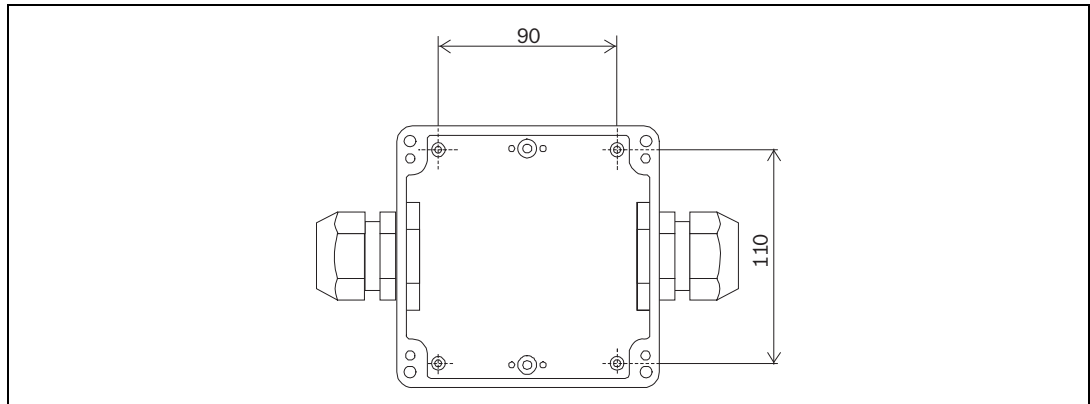


Figure 5.6 Boring distances of holes in base of FAS-ASD-WS air filter box

Air filter box

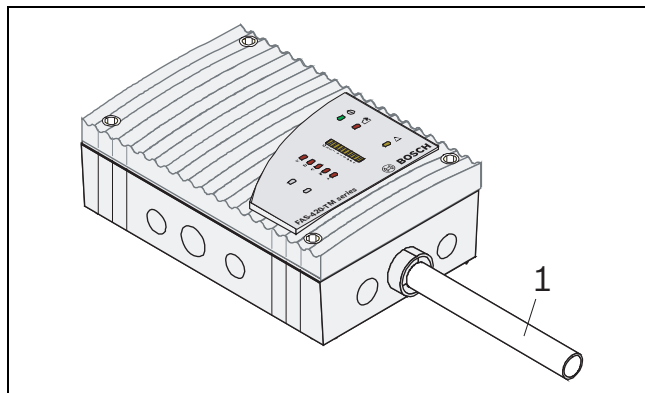
1. To use the filter box in the pipe system, use the two PG29 filter screw connections supplied.
2. Install these cable glands in precisely the same way as for the pipe adapter, for example.
3. When installing the filter, note the throughflow direction, which is specified on the type plate on the side of the lower part of the housing.
4. Screw the air filter housing directly onto the wall with the lower part of the housing.

Installation material

Cylinder or flathead screws are suitable for wall mounting:

- Maximum thread diameter: 4 mm
- Head diameter: 5 to 7 mm.

5.6 Air-return Pipe



1 Air-return pipe (aspiration pipe)

Figure 5.7 Installing the air-return pipe

Feed the air-return pipe into the designated pipe connection of the FCS-320-TM. The air-return pipe fits perfectly in the connection and guarantees a firm hold.



NOTICE!

The pipe must be fixed immediately in front of the unit so that the pipe does not pull out of the pipe connection due to any change in length that occurs (see *Section 5.1 Length Change of the Pipe System*, page 67).

5.7 Three-way tap

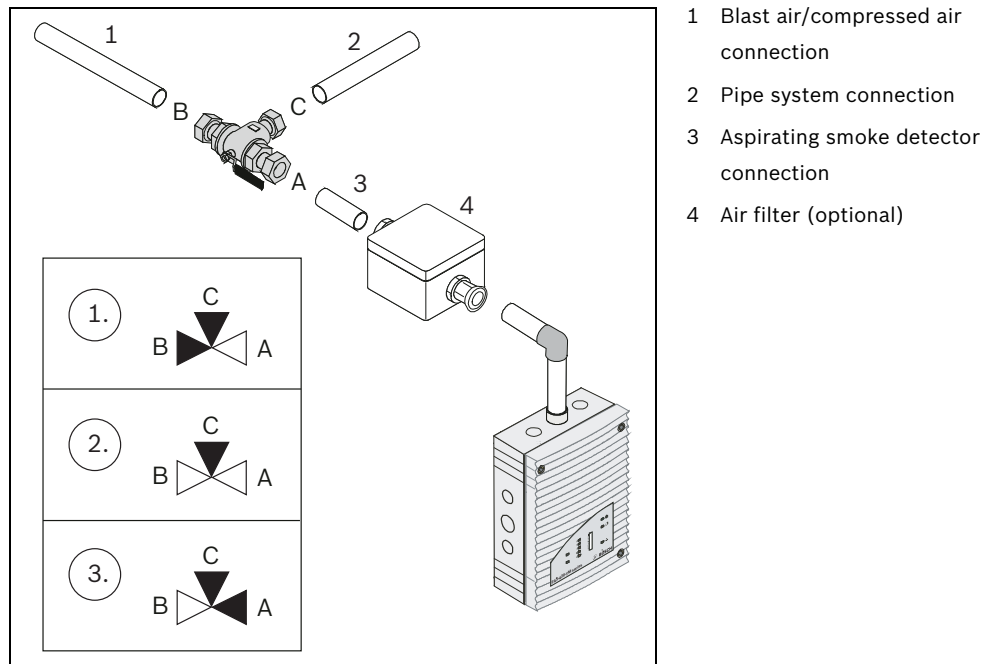


Figure 5.8 Installing the three-way tap

The three-way tap is required to blow out the pipe system with blast air (as a preference) or compressed air*. The aspirating smoke detector and the downstream pipe system accessory components (e.g. air filter) must not and cannot be blown-out.

A check valve for relieving pressure from the pipe system must be fitted to the end of each pipe branch. The check valve prevents damage to the air sampling openings and prevents dirt deposits from being blown through the pipe system.

To prevent aspiration reducing film sheets in deep-freeze areas from tearing, it is advisable to use special deep-freeze aspiration reductions. Check valve and deep-freeze aspiration reductions are available on separate order.

* Compressed air is compressed, non-purified and humid ambient air. Blast air, on the other hand, is purified and dehumidified air. If the FCS-320-TM and pipe system are located in areas with temperatures below freezing, blast air is to be used for blowing out.

Connections

Fasten the three-way tap using the transition screw connections in the pipe system.

When installing, note the assignment of the connections (see *Figure 5.8*):

- Install the aspiration pipe system on connection C.
- Install the FCS-320-TM on connection A.
- Attach the blast air supply (blast or mobile blowing-out system) to connection B of the three-way tap.

Refer to *Section 7.7 Blowing-out Process for the Pipe System, page 90* for information on how to carry out the manual blowing-out process.

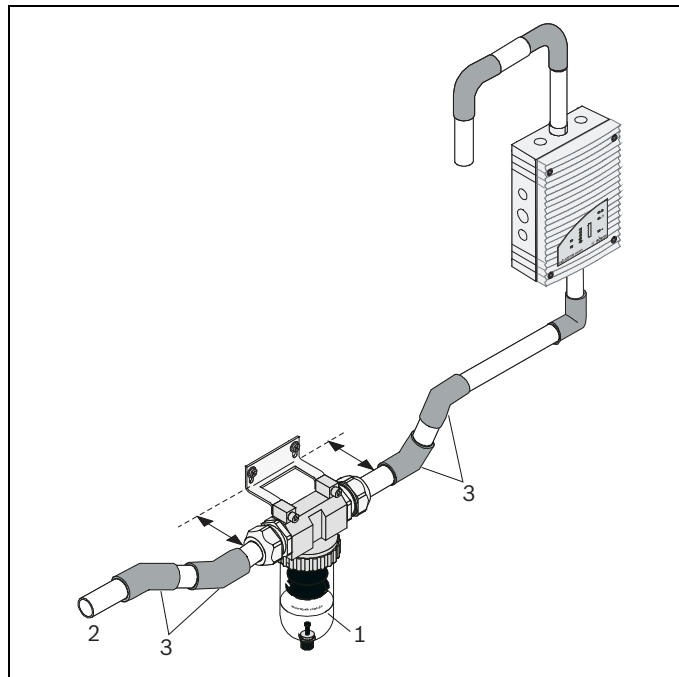
5.8 water separator

Standard

The standard water separator is installed using a PG29 screw connection and a T-piece between the FCS-320 and the pipe system.

FAS-ASD-WS Water Separator

The FAS-ASD-WS Water Separator must be fitted at the lowest point in the pipe system downstream of the air filter and the aspirating smoke detector (see *Figure 5.9*).



- 1 water separator
- 2 Pipe system connection
- 3 45° pipe elbow

Figure 5.9 Installing the FAS-ASD-WS Water Separator in the pipe system

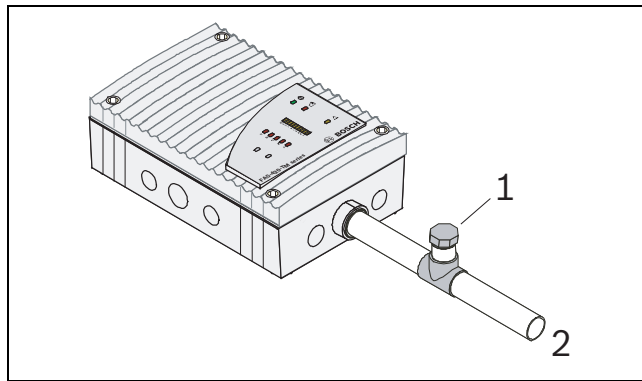
Connection

Attach two 45° pipe elbows on both sides (**not** supplied as standard) in order to achieve the optimum distance from the wall for mounting the brackets. When installing, note the correct direction of flow (see arrow on plastic container).

Also fasten the water separator with two screws and the clamp.

To empty, open the drain valve (see *Section 7.12 Maintenance Intervals, page 93*).

5.9 Test Adapter



- 1 Test Adapter
- 2 Pipe system connection

Figure 5.10 Installing the test adapter in the pipe system

For test purposes, the pipe system connection is simply pulled out and the test pipe connected directly to the aspirating smoke detector. However, this is not possible if the aspiration pipe system has to be permanently mounted. A test adapter should be used for this application.

The test adapter is glued into the pipe system in the direct vicinity of the aspirating smoke detector. During normal operation, the test adapter must always be closed. It is only opened for maintenance and service purposes in order to admit test gas or smoke.



CAUTION!

Once the detection system of the aspirating smoke detector and the alarm transfer have been tested (see *Page 79*), the test adapter must be closed again; otherwise there will be an airflow malfunction!

6 Commissioning

6.1 Preparation

Checking the settings

Install the pipe system fully before inserting the detection unit and connect it to the housing base of the FCS-320-TM.

Connection test

Check whether...

1. The correct aspiration reducing film sheets are glued to the air sampling openings.
2. The pipe system is securely connected to the FCS-320-TM pipe connection.
3. All pipe fittings are glued together and the pipe system is sealed.
To do this, first close all air sampling openings (e.g. with duct tape). Then measure the negative pressure at the opening for the return airflow using a digital precision pressure gauge (see *Section 6.7.2 Conducting the Functional Test, page 82*).
After a short run-up time, the negative pressure must be 80 Pa.

FAS-ASD-DIAG Diagnostic Software

Then check the system using the FAS-ASD-DIAG Diagnostic Software.

Follow the procedure below:

1. Install the diagnostic software on a laptop or PC (for system requirements and connections, see *Section 4.6 Data Logging, page 64*).
2. The data transmission of the FCS-320-TM takes place bidirectionally via the infrared port on the front of the device. The diagnostic appliance is connected to the PC using the USB cable provided.
3. The diagnostic software is started.

The current FCS-320-TM data is displayed on the PC's screen.



NOTICE!

For a later evaluation of the airflow value, record the calibration type (see *Section 6.3 Calibrating the Airflow Sensor*), start-up temperature, air pressure and height above sea level in the test log (see *Section 8.3 Test Log for FCS-320-TM Series Aspirating Smoke Detectors, page 96*).

6.2 Detection Unit Commissioning

1. Insert the FCS-320-TM detection unit into the pre-mounted housing base, which has been checked for correct wiring.



NOTICE!

When inserting the detection unit, be aware of the mechanical coding, which protects the device against twisting.

2. Replug the X4 jumper when inserting the detection unit (PIN 1-2 or PIN 2-3, or vice versa). Replugging will cause airflow calibration to be carried out automatically (see *Figure 6.1*).
3. The green operation display flashes when the FCS-320-TM is initializing. If initialization is complete, the operation display lights up permanently.
4. The airflow of the FCS-320-TM must not be influenced during the initialization phase.

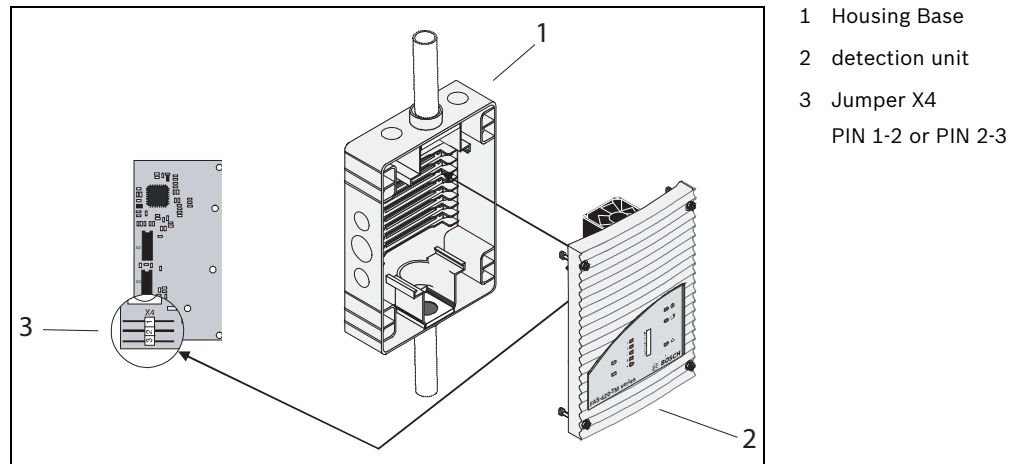


Figure 6.1 Inserting the detection unit into the housing base

6.3 Calibrating the Airflow Sensor

The airflow initialization of the FCS-320-TM is successfully completed if the status of the temperature and the airflow stabilizes for a period of 2 minutes, i.e.:

- The temperature fluctuates by less than 0.1 °C
- The airflow is not fluctuating too heavily (temperature control)
- The fan voltage can be set normally; fan and fan power pack working normally

The maximum operating period is 2 hours.

The airflow initialization is aborted immediately if one of the following errors occurs:

- Temperature measurement faulty
- Airflow measurement faulty
- Fan control faulty

The calibration of the airflow sensor can be carried out independently of the air pressure or depending on it.

To be able to judge the airflow sensor value correctly during start-up work, always adhere to the type of calibration in the test log.

6.3.1 Air-Pressure-Independent Calibration

Calibration of the FCS-320-TM independently of the air pressure takes place automatically each time the detection unit is inserted into the housing base and the X4 jumper is replugged, or via the FAS-ASD-DIAG Diagnostic Software.

During the teach-in phase, the alarm detection is fully functional. The operating display flashes during this time and the airflow must not be influenced in any way. On completion of initialization, the operating display is permanently lit and the airflow sensor has determined a target value for the connected pipe system.

6.3.2 Air-Pressure-Dependent Calibration

A calibration of the airflow sensor that is dependent on the air pressure can only be carried out using the FAS-ASD-DIAG Diagnostic Software. A barometer is required for this (recommended: GPB 1300 digital precision pocket barometer from Greisinger electronic GmbH).

The following steps are required:

1. In the "Settings" screen, press the bottom button [Set], so that you can change the values in the diagnostic software.

TITANUS MICRO-SENS

File Record Settings Device-Selection ?

Status Fault messages **Settings** ROOM-IDENT

Sensitivity (Fire alarm) %/m Fault latched

Alarm delay s Dynamic air flow

Air flow range % ROOM-IDENT

Fault delay min s LOGIC-SENS

Action alarm threshold %

Height above sea level m Active Initialisation

Air pressure hPa

Fan voltage V

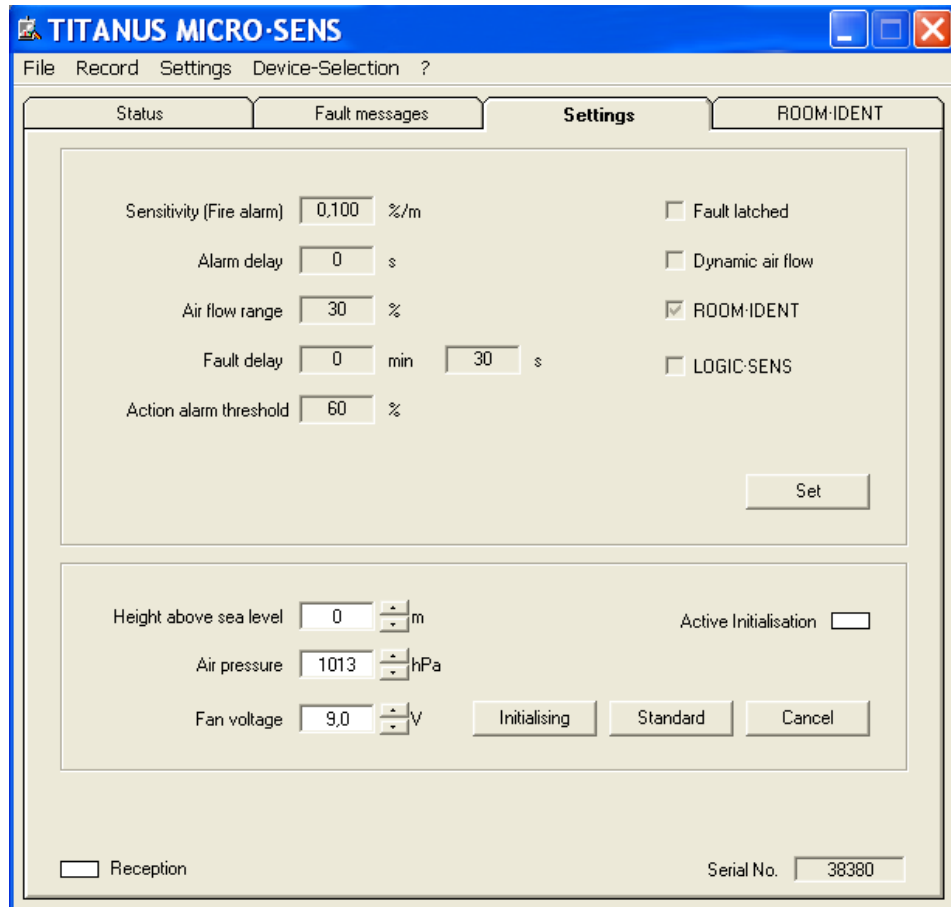
Reception Serial No.

- Determine the height above sea level of the installation location of the aspirating smoke detector and enter this value into the relevant input field.
- Measure the air pressure using the handheld barometer and enter this value in the relevant input field.

**NOTICE!**

If this measured air pressure does not correspond to the respective average height for the year, the airflow sensor is not calibrated to 0%.

- Press the [Initialising] button to confirm.



6.4 Checking the Detection Unit and Alarm Transfer

1. Trigger the FCS-320-TM using test aerosol. Spray the test aerosol either into the first air sampling opening or into the test adapter on the pipe system.
2. Use the table below to check the transmission line to the fire panel.

Check...	If this is not the case, ...
- Whether the alarm is displayed on the aspirating smoke detector	- Check whether the display board is connected - There is a fault with the aspirating smoke detector Replace the detection unit
- Whether the alarm is transmitted to the fire panel and reported on the appropriate line	- Check the transmission lines



NOTICE!

Note all checked data in the test log.

6.5 Checking malfunction transmission



NOTICE!

The steps below may only be carried out following an airflow calibration in accordance with Section 6.3 *Calibrating the Airflow Sensor*.

Malfunction transmission occurs as part of checking the airflow monitoring system (as per section below).

Check whether, when a pipe breakage and an obstruction are detected, the malfunction is displayed at the aspirating smoke detector and at the fire panel.

6.6 Checking Airflow Monitoring



NOTICE!

The steps below may only be carried out following an airflow calibration in accordance with *Section 6.3 Calibrating the Airflow Sensor*.

Pipe breakage

Check the breakage detection:

1. Detach the pipe from the connection to the FCS-320-TM or open the test adapter.
2. Check whether the malfunction display on the smoke aspiration system lights up.
3. Alternatively, check the data of the airflow sensor using the diagnostic appliance and a PC or laptop.
4. Enter the result in the test log.

obstruction

Check the obstruction detection:

1. Close – depending on the planned airflow monitoring – the corresponding number of air sampling openings with some duct tape.
2. Check whether the malfunction display on the aspirating smoke detector lights up.
3. Alternatively, check the data of the airflow sensor using the diagnostic appliance and a PC or laptop.
4. Enter the result in the test log.

Troubleshooting

If the airflow malfunctions are not correctly detected by the unit, proceed as follows:

Check whether...

1. All borings are free
2. The pipe system has breaks or fractures
3. All pipe connections are tight
4. The fan can blow out freely
5. The correct aspiration reducing film sheets were used
6. Any test adapters and air filters are closed
7. Any filter inserts are clean
8. Any ball valves and blowing-out valves are in the operating position.

If no faults are detected, the operativeness of the FCS-320-TM and/or the airflow sensor is checked by means of the test pipe or diagnostic software (see *Section 6.7 Functional Test of Airflow Sensors, Page 80*).

6.7 Functional Test of Airflow Sensors

Check the operativeness using a test pipe and a digital precision pressure gauge and with the aid of a PC and the FAS-ASD-DIAG Diagnostic Software.

A full functional test using the digital precision pressure gauge is described below. A limited functional test can also be carried out without a digital precision pressure gauge.

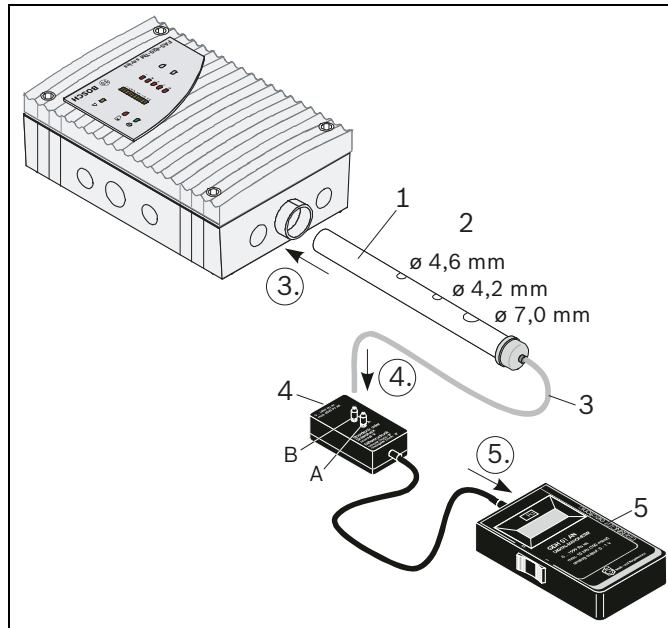
6.7.1 Preparations for the Functional Test

9. Disconnect the pipe system from the FCS-320-TM.



NOTICE!

Once the pipe system has been disconnected from the FCS-320-TM, the device reports a malfunction when the set airflow malfunction delay has elapsed. If no airflow malfunction is detected, the device is faulty.



- 1 Test pipe
- 2 Aspiration borings
- 3 Pressure measuring hose
- 4 Adapter
- 5 Digital precision pressure gauge
- A/ Adapter connection
- B

Figure 6.2 Checking the pipe system connection

10. Connect the test pipe.
11. Connect the pressure measuring hose to the adapter connection B. When carrying out a limited functional test without a digital precision pressure gauge, the connection for the pressure measuring hose on the test pipe must be closed.
12. Connect the 4-pin plug of the adapter to the digital pressure gauge.
13. Connect the PC to the FCS-320-TM through the diagnostic appliance and start the diagnosis program.

14. Open the "Settings" screen in the diagnostic software and enter the following settings for the functional test:

The image shows two screenshots of the 'TITANUS MICRO-SENS' diagnostic software interface. The top screenshot shows the 'Settings' tab with the following parameters:

- Sensitivity (Fire alarm): 0.500 %/m
- Alarm delay: 10 s
- Air flow range: 30 %
- Fault delay: 0 min, 30 s
- Action alarm threshold: 60 %
- Buttons: Accept, Standard, Cancel
- Height above sea level: 0 m
- Air pressure: 1013 hPa
- Fan voltage: 9.0 V
- Buttons: Set
- Reception:
- Serial No.: 00000

The bottom screenshot shows the same interface, but with the 'Set' button highlighted, indicating the settings have been applied.

15. You can use the diagnosis program to track the airflow values and the fault messages during the functional test.
Information for installing the diagnostic software can be found in *Section 6.1 Preparation*, page 76.

6.7.2 Conducting the Functional Test



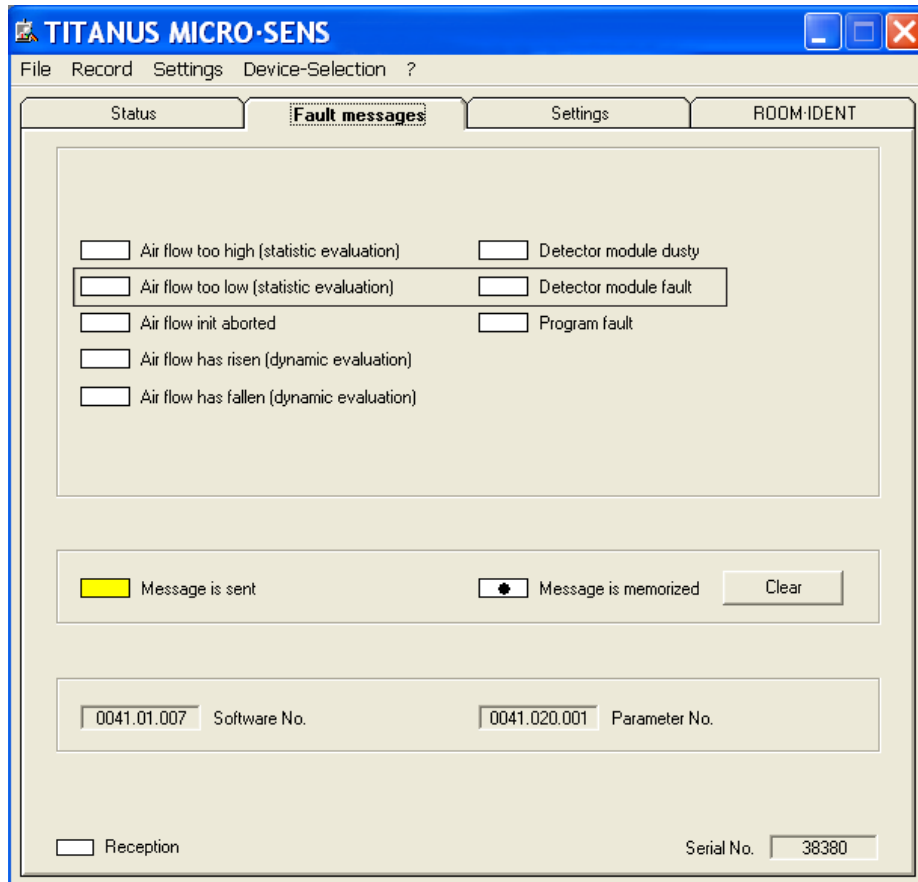
NOTICE!

On completion of the functional test, the original settings must be restored. You should therefore record this data (e.g. using the log for the device as a saved text file).

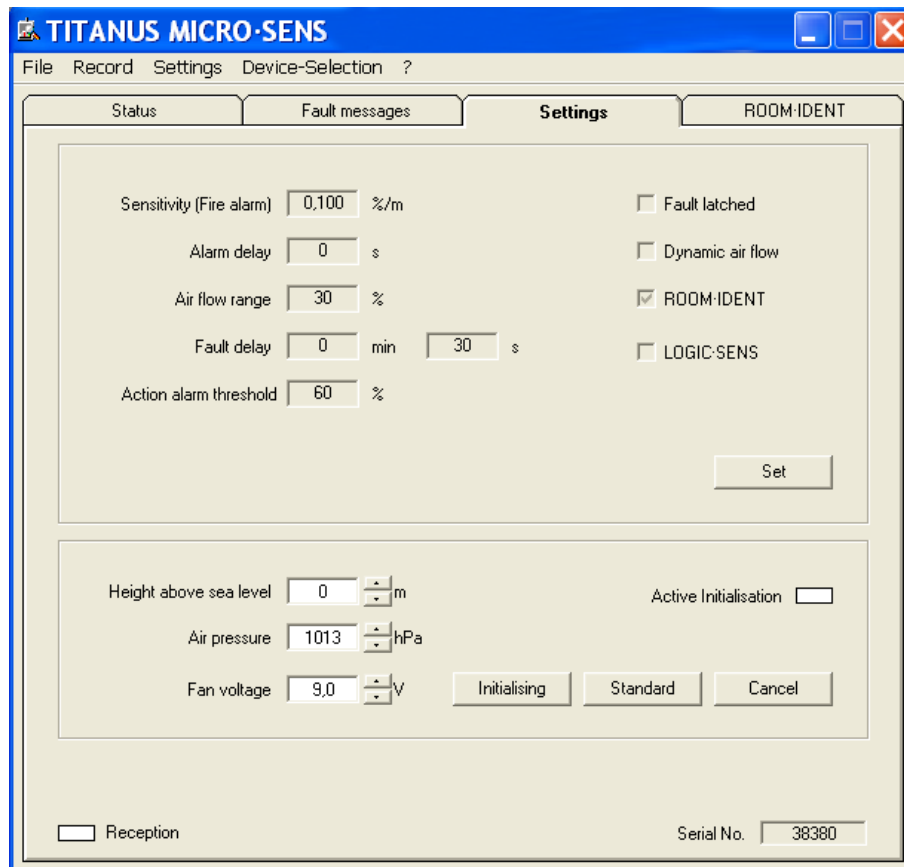
1. Close all the test pipe's aspiration borings with some duct tape.
After a short run-up time, the negative pressure produced by the FCS-320-TM must be 80 Pa. This step can be omitted if a limited functional test is carried out without a digital precision pressure gauge.

**NOTICE!**

Once the aspiration borings have been closed, the device reports the malfunctions "Air flow too low (static evaluation)" and "Detector module fault" within 30 seconds.



2. Free up the 4.6 mm and 4.2 mm aspiration borings on the test pipe again.
3. In the "Settings" screen, click on the [Set] button at the bottom and start the airflow initialization by pressing the [Initialising] button.
The fault messages and indications must go out. The "Active Initialisation" field in the "Settings" screen of the diagnostic software flashes while initialization is in progress.



4. After initialization, close the 4.2 mm aspiration boring of the test pipe with some duct tape. After approximately 5 secs, the fault indication on the device must start to flash. After approximately 35 secs, the fault indication on the device must be permanently illuminated. The device reports the malfunction "Air flow too low (static evaluation)". The airflow value is approximately -35%.
5. Open the 4.2 mm aspiration boring again. After a few seconds, the fault indication on the FCS-320-TM must stop flashing.
6. Open the 7.0 mm aspiration boring on the test pipe. After approximately 5 secs, the fault indication on the device must start to flash. After approximately 35 secs, the fault indication on the device must be permanently illuminated. The device reports the malfunction "Air flow too high (static evaluation)". The airflow value is approximately +85%.
7. Close the 7.0 mm aspiration boring again. After a few seconds, the fault indication on the FCS-320-TM must stop flashing.
8. Remove the test pipe and reconnect the pipe system.

NOTICE!



- On completion of the functional tests, the original settings must be restored.
- The commissioning of the device with the pipe system must be repeated from *Section 6.3 Calibrating the Airflow Sensor*.
- Once commissioning has been concluded, the set values must be collected and saved using the FAS-ASD-DIAG Diagnostic Software. A printout of the set values should be placed in the project folder.

6.8 Fire Source Identification Commissioning

Fire source identification is set using the FAS-ASD-DIAG Diagnostic Software via the "ROOM·IDENT" screen.

1. Click the [Train] button. This opens the view with adjustable values used to determine the transport times for fire source identification in areas A-E.



NOTICE!

The commissioning of the fire source identification does not make any distinction between the "ROOM·IDENT" function and the "Fire alarm after ROOM IDENT" function.

2. First enter the number of air sampling openings.
3. Then enter the blowing out time and voltage of the blowing out and aspiration fan. You can access the Help function by clicking the question mark to the right of the relevant setting.
4. Click the appropriate aspiration point (A-E) for which the transport time is to be determined.
5. Enter the preselection time necessary to reach the aspiration point and supply the smoke. Once the selected preselection time has expired, the appropriate smoke aspiration point must be charged with smoke. Once the preselection time has expired, the smoke must be available at the aspiration point for another 10 to 15 seconds.
6. Using the smoke level, check that there is no smoke in the aspiration pipe.
7. Click the [Start] button. The FCS-320-TM-R switches to the aspiration pipe blowing out. The display of the aspiration point concerned is yellow.
8. Once the preselection time has expired, the FCS-320-TM-R switches to aspiration. The smoke must now be available at the selected aspiration point. If smoke is detected by the FCS-320-TM-R, the smoke level will indicate this. The display of the selected aspiration point turns green and the determined time is entered. Teaching mode for the selected aspiration point is exited.

7 Maintenance

7.1 visual check

Check whether...

- The pipe system is securely installed and undamaged (where freely accessible)
- The air sampling openings of the pipe system are free
- The aspiration pipe and connection cable are securely connected
- The FCS-320-TM is undamaged.

7.2 Detection Unit and Alarm Transfer

Proceed in accordance with *Section 6.4 Checking the Detection Unit and Alarm Transfer, page 79*. Also check the detection unit visually for exterior contamination or damage and replace it if necessary.



NOTICE!

A hardware defect in the detection unit is displayed in the "Fault messages" screen of the diagnostic software.

7.3 Pipe System

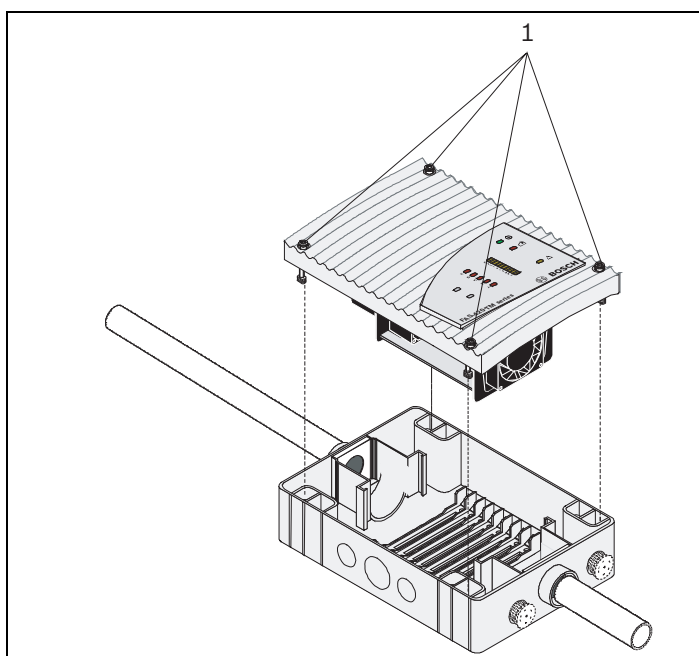
Check the pipe system and the air sampling openings for obstruction in areas susceptible to dust particles or icing. If necessary, blow out the pipe system and air sampling openings with blast air. Use a mobile cylinder of compressed air (blowing-out system) or activate the manual blowing-out system located on site. The components (compressors, compressed air containers, dryers) required to supply the compressed air can be obtained directly from the relevant compressed air system suppliers.



CAUTION!

Before blowing out the pipe system, disconnect the FCS-320-TM from the pipe system; otherwise, the airflow sensor will be damaged.

7.4 Replacing the Detection Unit



1 Screws

Figure 7.1 Replacing the detection unit of the FCS-320-TM

1. Remove the four screws from the detection unit using a screwdriver and pull the detector unit out of the housing base.
2. Insert the new detection unit into the housing base. When doing this, be aware of the mechanical coding, which protects the device against twisting. Replug the X4 jumper.
3. Retighten the four screws on the detection unit using a screwdriver.
4. The unit is initialized automatically when the X4 jumper is replugged.

7.5 Replacing the Air Filter in the Housing Base

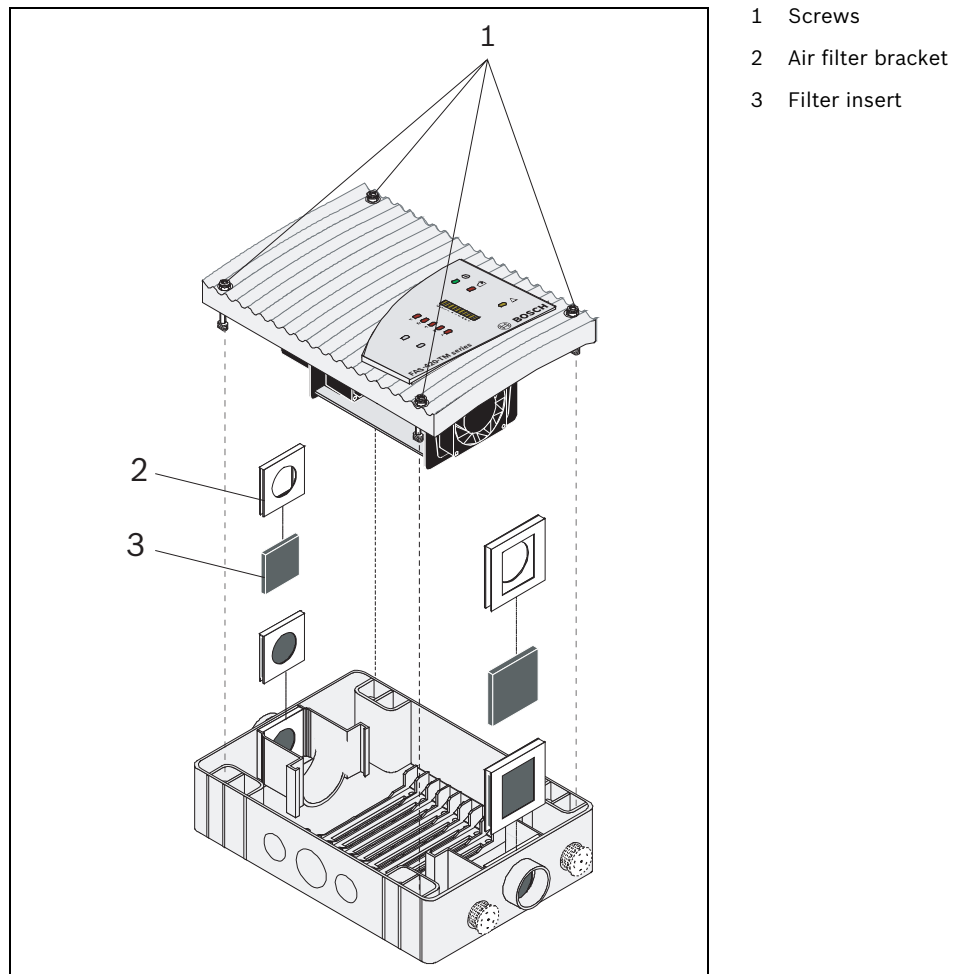
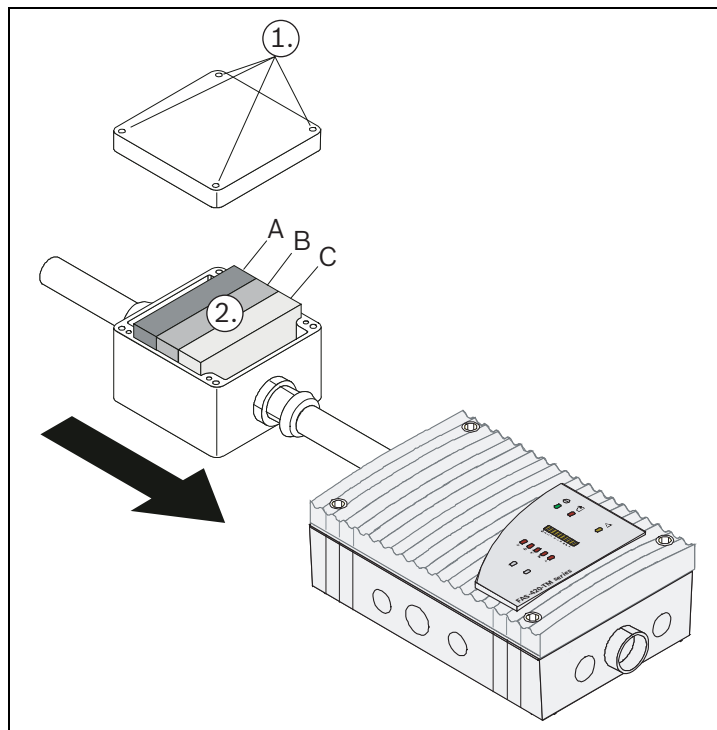


Figure 7.2 Replacing the detection unit of the FCS-320-TM

1. Remove the four screws from the detection unit using a screwdriver and pull the detection unit out of the housing base.
2. Pull both filter brackets out of the housing base and remove the filter inserts. Carry out a visual check for contamination and replace the filter if necessary. Then put the filter bracket back into position.
3. Retighten the four screws on the detection unit using a screwdriver.

7.6 Filter Change on the Air Filter Box



- A Primary filter
- B Coarse dust filter
- C Fine dust filter

Figure 7.3 Changing the filter inserts (in fig.: FAS-ASD-FL Filterbox Large)

To replace the filter inserts, proceed as follows (see *Figure 7.3*):

1. Remove the four screws and remove the housing cover.
2. Remove the old filter inserts and clean the inside of the housing carefully to remove dust. Now fit the cleaned or new filter inserts. When using the spare filter set for the large filterbox, ensure you follow the correct sequence (see label on base of housing).
Replace the housing cover and screw it back on.



NOTICE!

In applications with largely fine dust build-up, three fine dust filters can also be used (subject to separate order).



NOTICE!

Opening the housing cover of the filterbox causes an airflow malfunction in the FCS-320-TM.

7.7 Blowing-out Process for the Pipe System

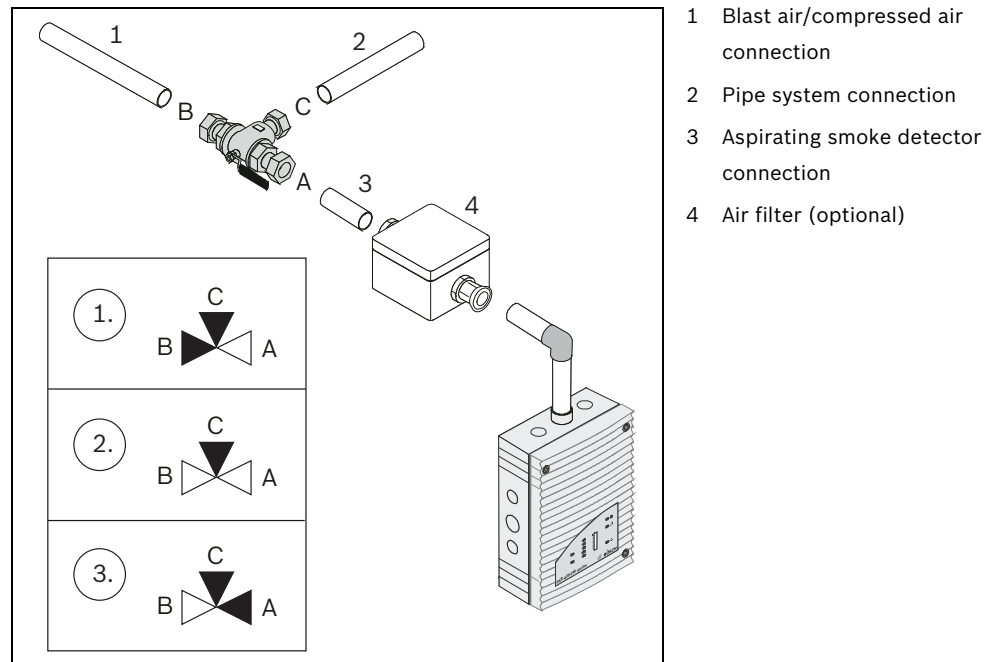


Figure 7.4 Installing the three-way tap

The blast air supply (compressor or mobile blowing-out system) required for the blowing-out process for the pipe system must be connected via the quick lock coupling fitting to the three-way tap on the pipe system.

A check valve for relieving pressure from the pipe system must be fitted to the end of each pipe branch. The check valve prevents damage to the air sampling openings and prevents dirt deposits from being blown through the pipe system. To prevent aspiration reducing film sheets in deep-freeze areas from tearing, it is advisable to use special deep-freeze aspiration reductions.

The manual blowing-out process on the pipe system is carried out as follows (see *Figure 7.4*):

1. Position the tap lever so that the blast air and pipe system are connected (B-C connection).

The connection to the FCS-320-TM must be blocked for blowing-out!

Manually blow out the pipe system for approximately 10 seconds.

2. Set the lever of the tap such that the device is not connected with the pipe system or with the connection for the blast or compressed air supply. Wait approximately 20 seconds so that dust and dirt raised in the pipe system can settle and thus will not be sucked through the aspirating smoke detector.
3. Reconnect the blown-out pipe system to the FCS-320-TM within a further 10 seconds by switching over the tap accordingly (A-C connection).

7.8 Checking the Airflow Sensor Calibration

Check the airflow sensor value with the Diagnostic Software.

Functional principle

During initialization of the connected pipe system, the device saves the measured actual value of the airflow as a target value via the integrated airflow monitoring. This nominal value then serves as a reference value for the additional evaluation of a possible airflow malfunction. Depending on the airflow threshold selected (see "Adapting the airflow sensitivity" in *Section 3.3 Airflow monitoring, page 34*), the current airflow value during operation can fluctuate around this target value without triggering an airflow malfunction. Only if the selected airflow threshold is exceeded will the airflow malfunction be reported by the device and thus transmitted.

Checking the actual value

The tolerance range of the selected airflow threshold and the actual and target values are represented in the diagnostic software. The limits correspond to the airflow range set. Check the deviation of the actual value from the target value. If there is a deviation of $> \pm 3/4$ of the set threshold, you should check the pipe system carefully (see below: *Section Troubleshooting airflow malfunction*).



NOTICE!

The current airflow value may deviate from the target value not only due to a malfunction of the pipe system (break or obstruction), but also due to fluctuations in the air pressure in the environment.

Dependent on air pressure

To ensure long-term fault-free operation of the device, the airflow sensor must be calibrated depending on the air pressure (see *Section 6.3.2 Air-Pressure-Dependent Calibration, page 77*). Only with this type of calibration do low air pressure fluctuations remain within the monitoring window and thus in the permissible tolerance range.



CAUTION!

If the airflow change is set at less than 30%, an air-pressure-dependent calibration must be carried out.

Independent of air pressure

If the sensor calibration is carried out independently of air pressure, fluctuations in the air pressure can cause undesired airflow malfunctions. If the change in airflow is greater than 30%, the calibration of the airflow sensor can be carried out independently of the air pressure; it must then be ensured that no fluctuations in air pressure can occur in the immediate environment.



CAUTION!

If air pressure fluctuations are anticipated in the immediate environment, the airflow sensor has to be calibrated in dependence of air pressure (see also *Section 3.3 Airflow monitoring, page 34*).

Troubleshooting airflow malfunction

If the airflow calibration has been carried out depending on air pressure and the actual value still does not lie within the tolerance range of the selected airflow threshold (airflow malfunction displayed on the device), then a further disturbance value in addition to air pressure or temperature fluctuation exists.

**CAUTION!**

In case of a defect in the airflow monitoring, only authorized personnel may replace the detection unit!

1. In this case, check the pipe system for leaks and obstructions (see *Section 6.6 Checking Airflow Monitoring, page 80*, "Troubleshooting").
2. If this check reveals no malfunctions, check the airflow monitoring by connecting the test pipe and conducting the functional test in accordance with *Section 6.7.2 Conducting the Functional Test, page 82*.
3. If, during troubleshooting, the pipe network has been changed, the original configuration of the pipe network must be restored after the troubleshooting has been completed and the airflow must be recalibrated.

**CAUTION!**

It is essential that you adhere to the calibration type (air-pressure-dependent or air-pressure-independent) and, if necessary, the values for air pressure, height above sea level, and set voltage in the test log.

4. Observe the current airflow value during ongoing maintenance or check it at the latest during the next inspection.
5. If the target value is similar to the previous one, disruptive environmental influences are the cause of the deviation. If these negative influences on the airflow monitoring cannot be suppressed, increase the airflow range.

**NOTICE!**

The diagnostic software can be used to save in file format all the stored and current data for the device, as well as any settings made.

7.9**Testing the Fire Source Identification**

Fire source identification is tested using the FAS-ASD-DIAG Diagnostic Software via the "ROOM·IDENT" screen.

1. In the "ROOM·IDENT" screen, click the [Testing] button.
2. First select the preselection time and then click on the [Start] button to determine the source of the fire.
3. The FCS-320-TM-R switches to the aspiration pipe blowing out. The appropriate smoke aspiration point must be charged with smoke until the selected preselection time has expired. Once the preselection time has expired, the smoke must be available at the aspiration point for another 10 to 15 seconds.
4. Once the preselection time has expired, the FCS-320-TM-R switches to aspiration and the aspiration point measures the time it takes until smoke is detected. Check that it is the correct aspiration point.

7.10**Airflow monitoring**

A pipe breakage or pipe obstruction is indicated in the "Fault messages" screen of the diagnostic software.

Check airflow monitoring in accordance with *Section 6.6 Checking Airflow Monitoring, page 80*.

7.11**Malfunction Transmission**

A malfunction is indicated on the FCS-320-TM and on the fire panel, where applicable.

Proceed in accordance with *Section 6.5 Checking malfunction transmission, page 79.*

7.12 Maintenance Intervals

Maintenance comprises regular inspections and maintenance routines. The smoke aspiration systems should be checked when commissioned and then quarterly. At each fourth check, more comprehensive checks should be made, as described below:

- Quarterly test/inspection
- Annual test/maintenance + 4th annual inspection

Inspection

Measure	Further information can be found in...
visual check	<i>Section 7.1 visual check, page 86</i>
Detection Unit and Alarm Transfer	<i>Section 7.2 Detection Unit and Alarm Transfer, page 86</i>
Check the pipe system	<i>Section 7.3 Pipe System, page 86</i>
Checking the Airflow Sensor Calibration	<i>Section 7.8 Checking the Airflow Sensor Calibration, page 91</i>
Checking malfunction transmission	<i>Section 7.11 Malfunction Transmission, page 92</i>
Empty water separator (if necessary)	<i>Section 5.8 water separator, page 74</i>

Maintenance and 4th annual inspection

Measure	Further information can be found in...
visual check	<i>Section 7.1 visual check, page 86</i>
Detection Unit and Alarm Transfer	<i>Section 7.2 Detection Unit and Alarm Transfer, page 86</i>
Check the pipe system	<i>Section 7.3 Pipe System, page 86</i>
Checking the Airflow Sensor Calibration	<i>Section 7.8 Checking the Airflow Sensor Calibration, page 91</i>
Checking malfunction transmission	<i>Section 7.11 Malfunction Transmission, page 92</i>
Empty water separator (if necessary)	<i>Section 5.8 water separator, page 74</i>

8 Appendix

The form in Section 8.3 Test Log for FCS-320-TM Series Aspirating Smoke Detectors is required for commissioning (see Section 6 Commissioning, page 76 et seqq).

8.1 Planning without air filter

Sensitivity (% LT/m)	Number of openings							
	1	2	3	4	5	6	7	8
0.5	A	A	B	B	B	B	C	C
0.6	A	A	B	B	B	C	C	C
0.7	A	B	B	B	C	C	C	C
0.8	A	B	B	C	C	C	C	C
0.9	A	B	B	C	C	C	C	C
1.0	A	B	B	C	C	C	C	C
1.1	A	B	C	C	C	C	C	C
1.2	A	B	C	C	C	C	C	C
1.3	B	B	C	C	C	C	C	
1.4	B	B	C	C	C	C		
1.5	B	B	C	C	C	C		
1.6	B	C	C	C	C	C		
1.7	B	C	C	C	C			
1.8	B	C	C	C	C			
1.9	B	C	C	C	C			
2.0	B	C	C	C				

8.1.1 Without any other pipe accessories

Pipe shape	$U_{Fan}[V]$	Number of openings							
		1	2	3	4	5	6	7	8
I	≥ 9	40	40	40	40	40			
U	≥ 9	50	50	50	50	50	50	50	50
M	≥ 9	50	50	50	50	50	50	50	50
Double U	≥ 9	50	50	50	50	50	50	50	50

8.1.2 With water separator

Pipe shape	$U_{Fan}[V]$	Number of openings							
		1	2	3	4	5	6	7	8
I	≥ 9	40	40	40					
U	≥ 9	50	50	50	50	50	50		
M	≥ 9	50	50	50	50	50	50		
Double U	≥ 9	50	50	50	50	50	50	50	50

8.2 Planning with Air Filter

Sensitivity (% LT/m)	Number of openings							
	1	2	3	4	5	6	7	8
0.5	A	A	B	B	B	C	C	C
0.6	A	B	B	B	C	C	C	C
0.7	A	B	B	C	C	C	C	C
0.8	A	B	B	C	C	C	C	C
0.9	A	B	C	C	C	C	C	C
1.0	A	B	C	C	C	C	C	C
1.1	B	B	C	C	C	C	C	
1.2	B	B	C	C	C	C		
1.3	B	C	C	C	C	C		
1.4	B	C	C	C	C			
1.5	B	C	C	C	C			
1.6	B	C	C	C	C			
1.7	B	C	C	C				
1.8	B	C	C	C				
1.9	B	C	C	C				
2.0	B	C	C	C				

8.2.1 Without any other pipe accessories

Pipe shape	$U_{Fan}[V]$	1	2	3	4	5	6	7	8
I	≥ 9	40	40	40	40	40			
U	≥ 9	50	50	50	50	50	50	50	50
M	≥ 9	50	50	50	50	50	50	50	50
Double U	≥ 9	50	50	50	50	50	50	50	50

8.2.2 With water separator

Pipe shape	$U_{Fan}[V]$	1	2	3	4	5	6	7	8
I	≥ 9	40	40	40					
U	≥ 9	50	50	50	50	50	50		
M	≥ 9	50	50	50	50	50	50		
Double U	≥ 9	50	50	50	50	50	50	50	50

8.3 Test Log for FCS-320-TM Series Aspirating Smoke Detectors

Device number						
Serial number of detection unit						
Serial number of housing base						
---	Measurement value/set value					
Commissioning						
Visual check	+/-					
Negative pressure sensitivity	[Pa]					
Alarm delay	[s]					
Air flow range	[10-50%]					
Fault delay	[min]					
Malfunction saving	[yes/no]					
Dynamic air flow	[yes/no]					
Localization	[yes/no]					
LOGIC·SENS	[yes/no]					
Air-Pressure-Dependent Calibration	[yes/no]					
Air-pressure-independent calibration	[yes/no]					
Height	[m above sea level]					
Air pressure	[hPa]					
Fan voltage	[9-13.5 V]					
Airflow	[m/sec]					
Temperature	[°C]					
Obstruction malfunction						
LED flashes	+/-					
Relay fails after delay	+/-					
Signal transmission to fire panel	+/-					
Cause eliminated, LED off	+/-					
Relay activates after drop below threshold	+/-					
Cause eliminated, LED saved	+/-					
Relay remains off for min. 100 secs	+/-					
Breakage malfunction						
LED flashes	+/-					
Relay fails after delay	+/-					
Signal transmission to fire panel	+/-					
Cause eliminated, LED off	+/-					
Relay activates after drop below threshold	+/-					
Cause eliminated, LED saved	+/-					
Relay remains off for min. 100 secs	+/-					
Main alarm						
LED flashes	+/-					
Relay activates after delay	+/-					
Signal transmission to fire panel	+/-					
LED saved	+/-					
Relay saved	+/-					
Localization						
Blow-out time	[10-255 s]					
Blow out fan	[9-13.5 V]					
Intake fan	[9-13.5 V]					
LED localization permanently at air sampling opening A	[yes/no] / [sec]					
LED localization permanently at air sampling opening B	[yes/no] / [sec]					

LED localization permanently at air sampling opening C	[yes/no] / [sec]						
LED localization permanently at air sampling opening D	[yes/no] / [sec]						
LED localization permanently at air sampling opening E	[yes/no] / [sec]						
Response indicators							
Air sampling opening A	[yes/no]						
Air sampling opening B	[yes/no]						
Air sampling opening C	[yes/no]						
Air sampling opening D	[yes/no]						
Air sampling opening E	[yes/no]						
Legend: + OK / - not OK							

Place:

Issuer:

Date:

Signature:

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