Operating Instructions

Smoke Extraction System

TITANUS *TOP · SENS*®

BOSCH

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0 General Remarks

0.1 Introduction

This manual describes the following smoke extraction systems: TITANUS *TOP · SENS*® TT-1 and TITANUS *TOP · SENS*® TT-2. These systems may be used exclusively for early fire detection. Since these smoke extraction systems are devices in a single series, the designation TITANUS *TOP · SENS*® in the present operating instructions refers to both types (TITANUS *TOP · SENS*® TT-1 and TT-2) of the series. Device-specific characteristics of one type are explicitly mentioned.

All works may be carried out by qualified personnel only!

BOSCH Sicherheitssysteme GmbH, called BOSCH in the following, assumes no liability for damage and malfunctions that arise from the disregarding of this manual.

0.2 Safety Instructions

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

WARNING

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

NOTE

This symbol warns against behavior which, if disregarded, could cause operational malfunctions.

TIP

With attention to this symbol, you can achieve operational improvements.

0.3 Warranty

This manual is subject to technical changes without prior notice and makes no claim to completeness.

Only 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 smoke extraction system, installation of the pipe system, start-up, and maintenance
- Use of the smoke extraction system not in accordance with the regulations
- Insufficient maintenance of wearing parts
- Faulty repairs
- Arbitrary constructional changes to the smoke extraction system
- Acts of God

0.4 Copyright

1 Product Description

1.1 Properties of the TITANUS *TOP · SENS*® Smoke Extraction System

The TITANUS *TOP · SENS*® smoke extraction system can be used for space and equipment protection as well as for monitoring air-conditioning units and air-conditioning ducts.

LSN-compatible It can be connected directly to the local security network (LSN).

Sensitivity The device has a response sensitivity of up to 0.08 %/m, 0.025 %/m or 0.005 %/m light obscuration. Additional sensitivities can be set stepwise depending on the area of application. With the new high-power light source technology, a broad detection spectrum including all normal types of fire is achieved. (Device sensitivity, sensitivity of detection points, collective effect, see Chapter 4.4.)

If two TITANUS *TOP · SENS*® TT-2 detector modules are used, twice the space can be monitored.

The device has three alarm levels per detector module: the info-, pre- and fire alarm.

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

Secure 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 extraction systems. The airflow sensors used in the TITANUS *TOP · SENS*® reliably recognize malfunctions such as breaks in pipes or the blockage of suction openings.

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

Patented Suction Openings Depending on the planning, the suction openings of the pipe system require clearly-defined bore diameters. These precise suction openings are created using patented **suction-reducing film sheets**, marking tape, and clips, which not only permit comfortable installation, but also prevent “whistling“ auxiliary noises. Another advantage is the quick and easy detection and checking of the suction opening diameters.

Point-Type Detector Planning

The system's suction points can be equated with point-type smoke detectors. The monitoring surfaces can therefore be planned in accordance with the respectively-valid national regulations.

Diagnosis

For maintenance and service, there is a system available with diagnostic software that enables quick and comfortable error containment. The reading-out of the current and saved device states occurs via cable data transmission to the PC.

Selection of Blower Voltage

By plugging in the blower jumper, the blower voltage for special planning can be increased from 6.9 V to 9 V. This causes an increase in the air-transport speed and thus an abbreviation of the detection time.

1.2 Areas of Application

The TITANUS *TOP · SENS*® is a fire alarm system that can be used for early fire detection in spaces and for equipment.

Principle

Air samples are taken from the monitoring area by a pipe system with defined suction borings and supplied to the detector module.

It is especially well-suited for areas in which point-type detectors cannot be used or can only be used conditionally. Such areas include:

- areas that are difficult to access, in which point-type detectors are difficult to install and maintain,
- air-conditioned areas,
- areas whose height is greater than that allowed for point-type detectors,
- areas in which for aesthetic reasons point-type detectors are not desired,
- areas in which electromagnetic fields are influential,
- areas that are subject to high or low temperatures,
- areas with air pollution where filter elements are required,
- areas that must be protected against vandalism.

Space Protection

The TITANUS *TOP · SENS*® is suitable for monitoring spaces including

- those with double floors, false ceilings,
- tunnels, ducts, difficult-to-reach hollow spaces,
- storage, high-rack storage, elevator shafts,
- museums, cultural institutions,
- freezer storage.

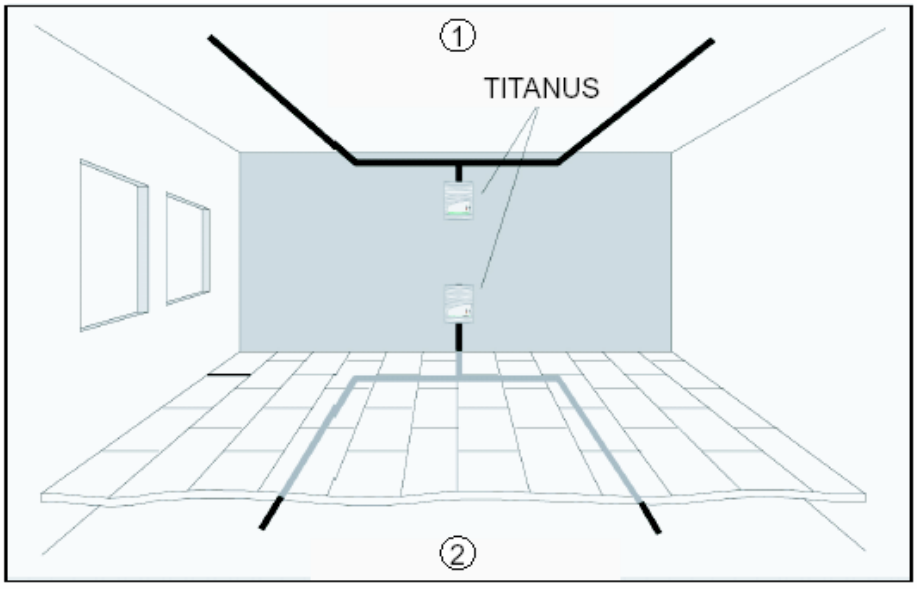


Fig. 1.1: Principle of space monitoring with TITANUS *TOP · SENS*® *smoke extraction system*

1 Pipe system room monitoring
2 Pipe system double floor

Space Monitoring with Air Conditioning

Space monitoring occurs:

- in spaces with air conditioning for server rooms, etc.,
- in blower ducts,
- over double floors, false ceilings,
- in IT rooms, e-distributor rooms, transformer cells,
- in air-conditioning units (see 1, Fig. 1.2), and
- in air-conditioning ducts in the bypass (see 2, Fig. 1.2).

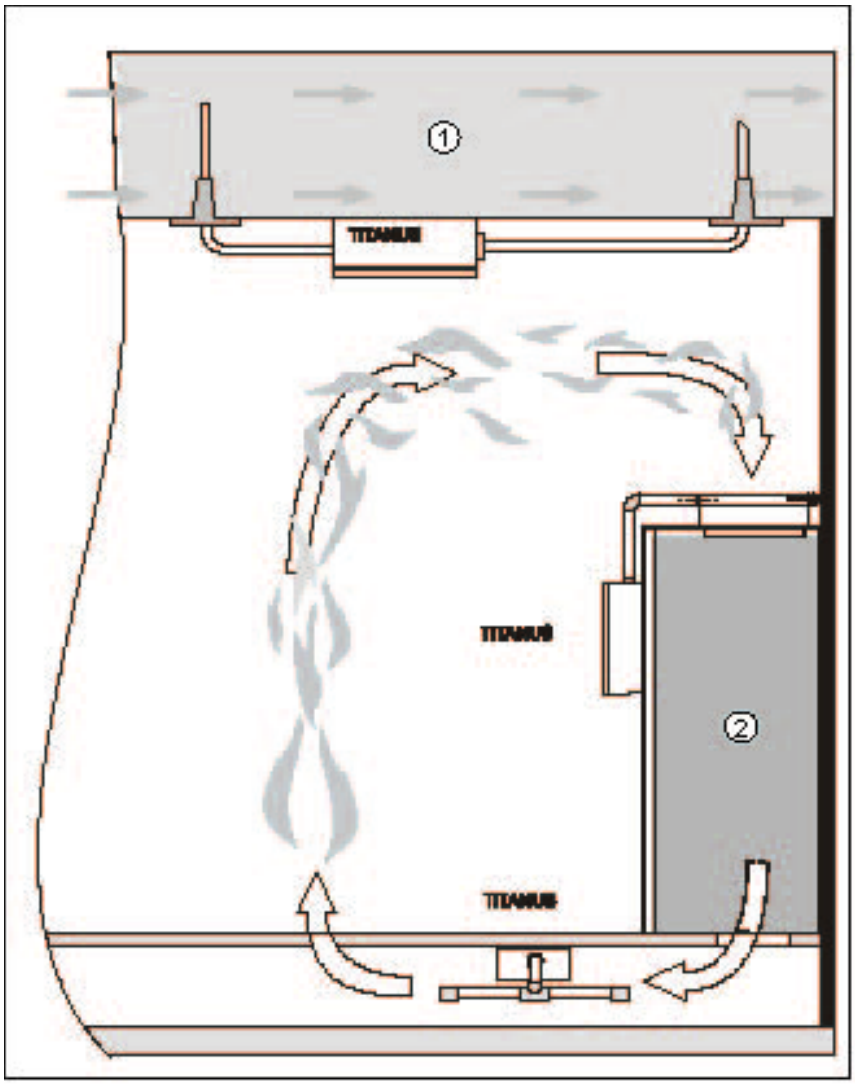


Fig. 1.2: Monitoring possibilities for an air-conditioning unit (1) or an air-conditioning duct (2) (depiction of principle)

Equipment Protection

With equipment monitoring, an object is monitored directly. These can be unventilated or mandatorily-ventilated devices or cabinets, e.g.

- distributor cabinets, switching cabinets
- telephone-switching equipment
- measuring, control, and regulation equipment.

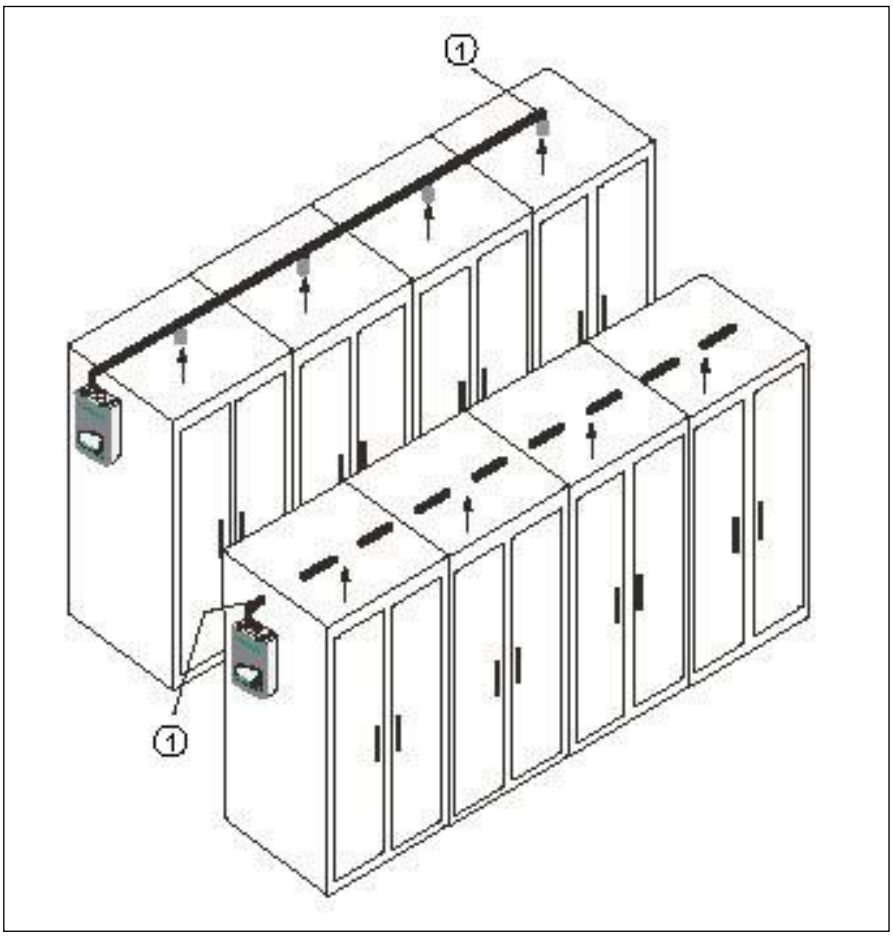


Fig. 1.3: Principle of equipment monitoring with TITANUS TOP · SENS® smoke extraction system

1 cracking

The *TITANUS* TOP · SENS® smoke extraction system can also be used for early fire detection in spaces with special air conditioning.

Thanks to its high sensitivity, expensive goods and equipment can be monitored reliably. The *TITANUS* TOP · SENS® is therefore also especially well-suited for areas of application with difficult detection conditions,

- in which early intervention is necessary due to high value concentration,
- in which equipment must always be ready for operation,
- in which highly-sensitive detection is necessary (e.g. in areas where, due to built-in filter elements, a small portion of smoke particles is available in the air),
- in which high air-exchange rates prevail.

2 Technical Description

2.1 System Description

The TITANUS *TOP · SENS*® smoke extraction system is composed of a basic device and a pipe system.

The basic device contains the sensitive detector module for the recognition of smoke aerosols, the suction unit for the transport of air samples to the detector module and the airflow sensor for monitoring the pipe system for breaks and blockage.

The pipe system consists essentially of pipe and fittings. The standard model is made of PVC. For equipment monitoring, halogen-free pipes should be used.

Each suction opening in the TITANUS *TOP · SENS*® pipe system represents a ceiling detector in the planning.

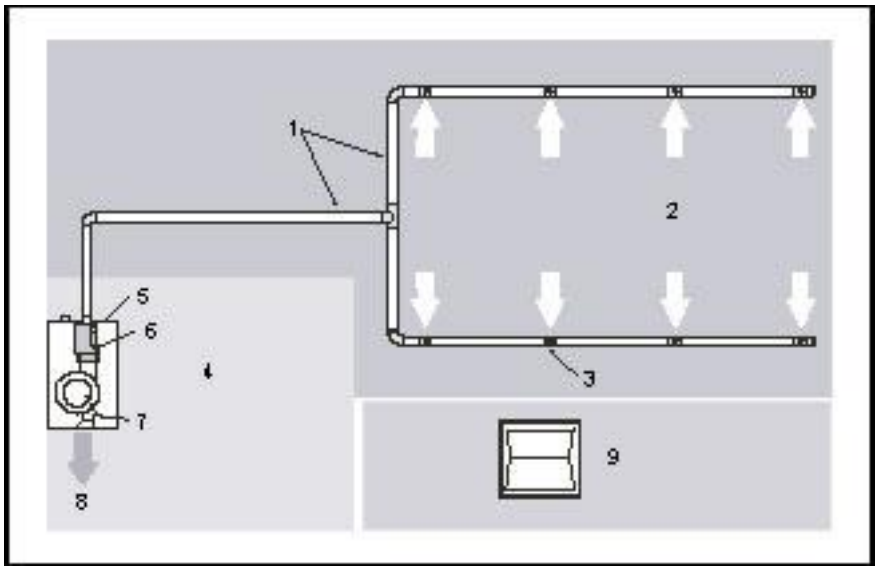


Fig. 2.1: Overview of the TITANUS *TOP · SENS*® *smoke extraction system*

1 *Pipe system*
2 *Air sampling*
3 *Suction openings*
4 *TITANUS basic device*
5 *Housing*
6 *Detector Module incl. air flow sensor*
7 *Suction unit*
8 *Air outlet*
9 *External detector alarm display*

To guarantee secure operation even under the most difficult conditions (clean rooms, recycling area), there are numerous accessories available, such as air filters, water separators, and external detector alarm displays.

2.1.1 Function

Air samples are taken from the area to be monitored using the suction unit via a pipe system with defined suction openings and supplied to the sensitive detector module (see Fig. 2.1).

Detector Module

Depending on the response sensitivity of the detector module used (optionally up to 0.8%/m, 0.25 %/m or 0.05 %/m light obscuration), the TITANUS *TOP · SENS*® triggers an alarm if the corresponding light obscuration is reached. Four different alarm thresholds can be set: Three alarm levels (info-, pre- and fire alarm) are displayed via the alarm LEDs on the device and transmitted to a connected fire panel. With the TITANUS *TOP · SENS*® TT-2 two alarm levels per detector module are transmitted to the BOSCH fire panels.

The alarm thresholds and the display and transmission of malfunctions can be supplied with different delay times (see Chapter 5.3).

Alarm messages are saved and are reset after the cause has been eliminated.

With the TITANUS *TOP · SENS*® TT-2 the two integrated detector modules allow the monitoring of two areas. When monitoring only one area, a two-detector dependency can be implemented. A two-zone dependency is only possible if connected to the Modular Fire Panel FPA-5000.

LOGIC · SENS

Using a switch, the intelligent signal processing ***LOGIC · SENS*** can be activated or deactivated on the TITANUS *TOP · SENS*® detector module. ***LOGIC · SENS*** makes a comparison of the measured smoke level with known disturbance values and decides between alarm and deception.

Monitoring Detector Module

Each detector module is monitored for soiling, malfunction of the signal, and removal. Soiling of the detector module has no effect on its sensitivity. A malfunction is displayed by the malfunction LED on the TITANUS TO*P · SENS*® and transmitted via the integrated coupler (a fire control interface and fire interface) to the fire panel. Malfunctions due to brief environmental fluctuations can be eliminated with a time-delayed setting.

Airflow Monitoring

An airflow sensor checks the connected pipe system for breaks and blockage. The airflow sensor can – depending on the construction of the pipe system (see Chapter 4 “Planning“) – detect at least a blockage of 50% of the suction openings up to complete blockage and a break in the pipe system, which has as a consequence the loss of 50% of the suction openings. On failure of the blower, the airflow in the pipe system is interrupted, which causes a blockage notification. The airflow monitoring is temperature-compensated and can be set depending on the air pressure.

After the expiration of a delay time that can be programmed via a switch, the malfunction is displayed on the smoke extraction system and the message is transmitted via the integrated coupler if necessary to the fire panel. The thresholds of the monitoring window can be adjusted to the environmental conditions (see Chapter 4 “Planning“).

The principal signal process of the airflow sensor displays

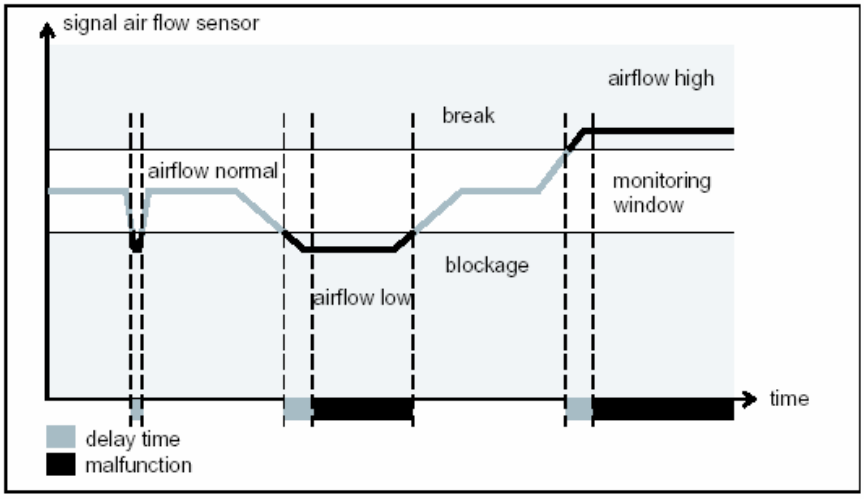


Fig. 2.2: Example of the signal process of the airflow sensor in case of malfunctions

Malfunction Display

A detector module or airflow malfunction generates a malfunction message that is displayed on the TITANUS *TOP · SENS*®. The malfunction display can be set to save or not save. If a fire panel is connected, the malfunction display must be set to not save.

Blink Code for Malfunction Recognition

The malfunctions and particular device states are displayed by 3 different blink codes via an LED on the electronics motherboard of each detector module. Thus it is possible to differentiate quickly among malfunctions that can be caused by a defective detector module, a blockage, or a break in the pipe system.

Resetting by Fire Panel

The resetting of a malfunction message occurs via the connected fire panel. The integrated couplers (fire control interface/fire interface) in the TITANUS *TOP · SENS*® ensure that alarm and malfunction messages on the device are reset simultaneously with the reset of the detector line.

Relay Output

For the existing alarm threshold and for the collective malfunction , the TITANUS *TOP · SENS*® has a potential-free switching contact. Thus the smoke extraction system can be connected to all current BOSCH fire panels.

Airflow Calibration

Thanks to the automatic airflow calibration the start-up of the TITANUS *TOP · SENS*® is simplified considerably. The initialization phase is executed optionally depending on the air pressure or independent of it.

To set the TITANUS *TOP· SENS*® to the characteristic airflow for the pipe network, the airflow-init process is executed. This must be executed for each device once at the beginning after installation, after each re-planning of the pipe system, and after changing the blower voltage, so that the device can acquire and save the airflow characteristic for the pipe network.

Pipe System

A pipe system up to a total length of 180 m with a maximum of 24 suction points can be connected to the TITANUS *TOP · SENS*® TT-1

2 pipe systems can be connected to the TITANUS *TOP · SENS*® TT-2. The entire pipe system then has a total length of 2 x 180 m and a maximum number of 2 x 24 suction points.

2.2 TITANUS *PRO · SENS*® and Accessories

2.2.1 Overview

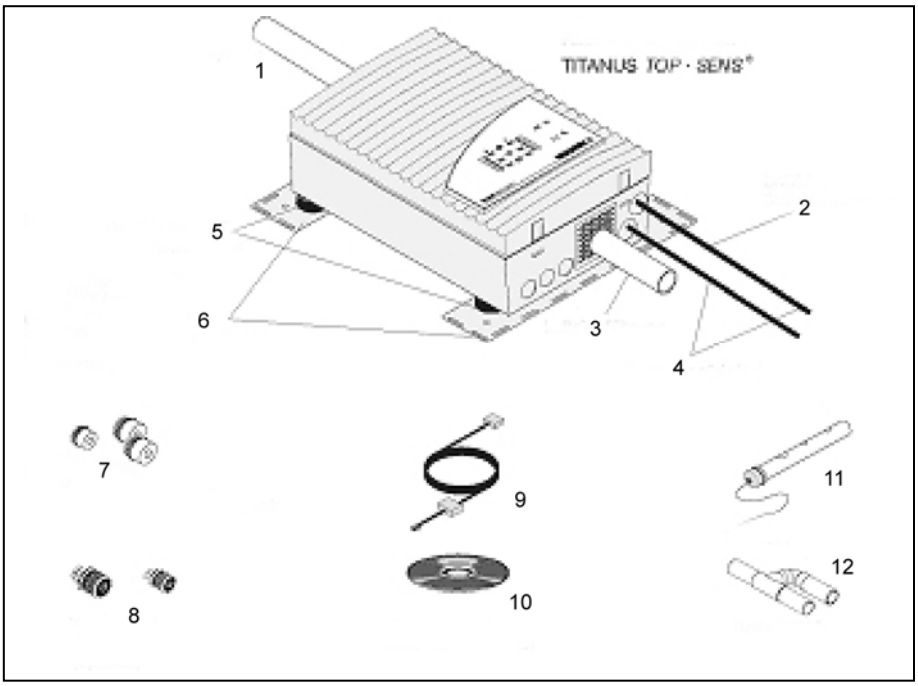


Fig. 2.3: Overview of the TITANUS *TOP · SENS*®

1 *Pipe system*
2 *Fire panel / power supply*
3 *Air return*
4 *Fire cable*
5 *Vibration absorbers (optional)*
6 *Device mounting (optional)*
7 *Cable feed through (1 x M20, 2 x M25)*
8 *Connection pieces (M20, M25), (optional)*
9 *Diagnostic cable (optional)*
10 *Diagnostic software (optional)*
11 *Test adapter (optional)*
12 *Test pipe (optional)*

The components marked “optional” are sold separately.

2.2.2 TITANUS TOP · SENS® Basic Device

The TITANUS *TOP · SENS*® basic device consists of the following components:

- plastic housing
  - plastic connection pieces
  - integrated air-return pipe
  - connection for pipe with 25 mm exterior diameter
- sensitive detector module with the newest technology according to the principle of optical scattered-light detector with integrated airflow monitoring
- suction unit with optimized air supply
- optical displays for alarm[1], malfunction, and operation
- diagnostic interface

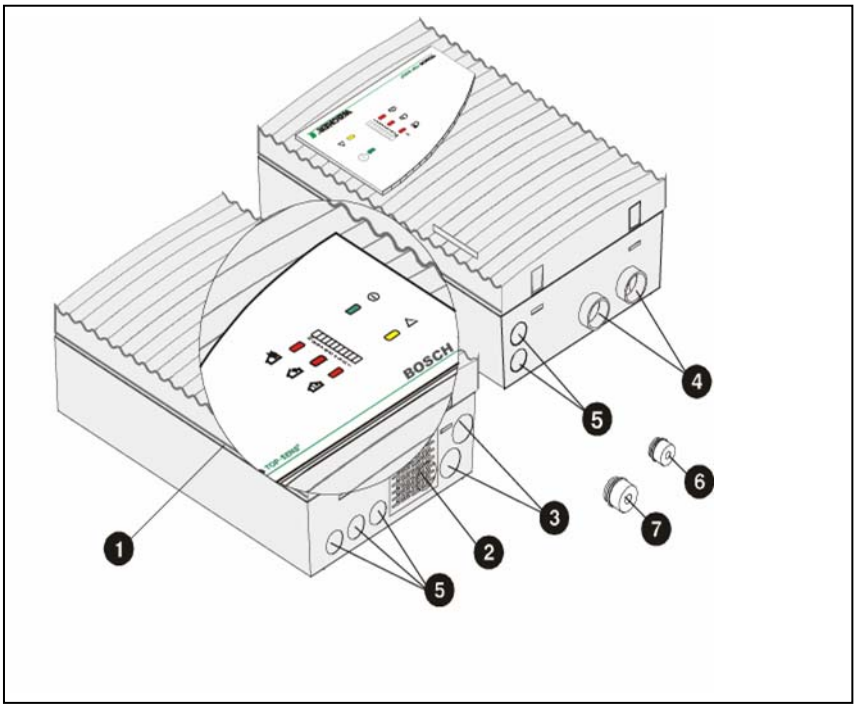


Fig. 2.4: Displays and connections for TITANUS TOP · SENS® (for explanations, see table on the next page)

[1] for TITANUS *TOP · SENS® 2*: optical display for Alarm 1 and Alarm 2

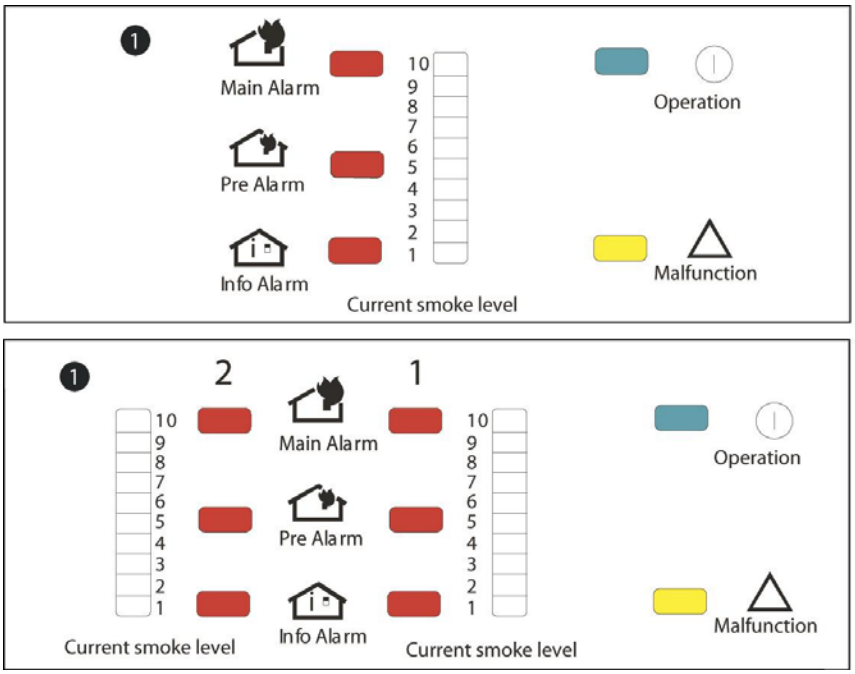


Fig. 2.5: Displays: TITANUS TOP · SENS® TT-1 (first) and TITANUS TOP · SENS® TT-2 (second), for explanations, see Number 1 in the table

TITANUS T*OP · SENS*®

Fig. 2.4:	**Function**	**Explanation**
❶	**Displays** (see Fig. 2.5)	
	Display of the smoke level 1 to 10 (10 yellow LEDs)	Current smoke level
	Operation (green LED)	Operation display
	Main alarm (red LED)	100% smoke level
	Pre-alarm (red LED)	66% smoke level
	Info alarm (red LED)	33% smoke level
	Malfunction (yellow LED)	Malfunction of pipe system or failure of the blower or malfunction of detector module
❷	Connection for air-return pipe	For air return
❸	Cable feed-through fire panel cable for connection of fire panel or power supply (input/output)	2 x M 25
❹	Connection suction pipe The second connection is only used with the TITANUS T*OP · SENS*® *2*.	for ∅ 25 mm pipe system
❺	Cable feed-through fire panel cable	1 x M 20
❻	Plastic connection pieces (small)	1 x M 20 for cable with ∅ of 8 to 12 mm
❼	Plastic connection pieces (large)	2 x M 25 for cable with ∅ of 9 to 14 mm (can be expanded to ∅ 14 to 18 mm)

2.2.3 *DIAG* Diagnostic Software

The diagnostic software allows the display of saved and current device states and error messages on a PC or laptop. Data transmission occurs via the diagnostic cable (3), which is connected to the motherboard on the TITANUS *TOP · SENS*® using the X2 plug (1), (see Fig. 2.8).

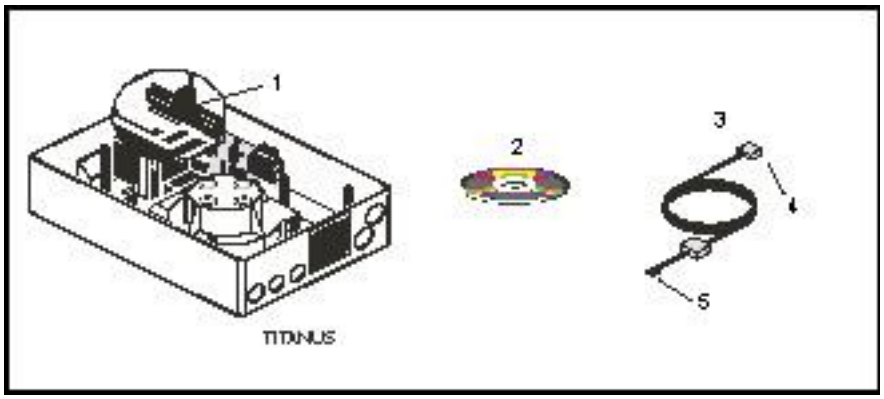


Fig. 2.6: Diagnostic software for reading out device states

1 X2 plug
2 CD-ROM dignostic software DIAG 2
3 Diagnostic cable
4 Connection to a PC
5 Connection to the TITANUS device

Diagnostic messages remain saved in the diagnostic software 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).

A reset of the device via the diagnostic software causes the deletion of all saved diagnostic messages.

The software also allows the deletion of error messages.

TIP

Using diagnostic software, all saved and current diagnostic data as well as the settings undertaken using the DIL switches can be saved as a file. To be able to compare the data read out, save each file under a different file name.

2.2.4 Device Mounting

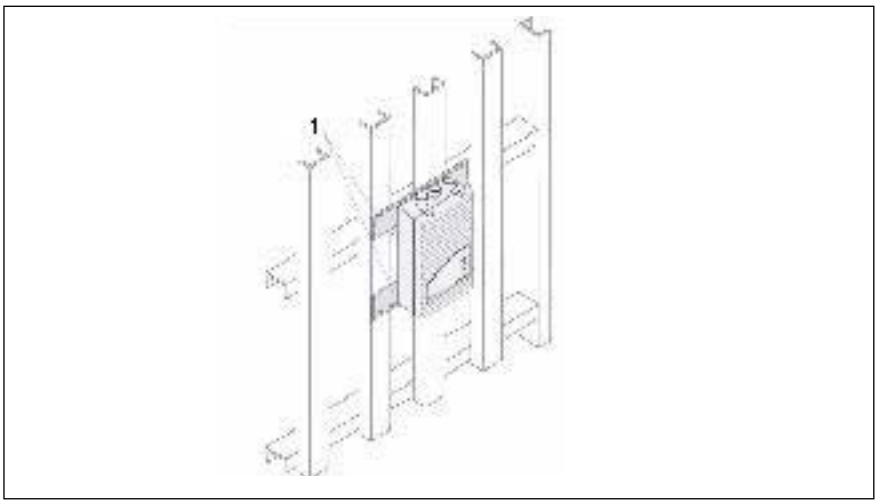
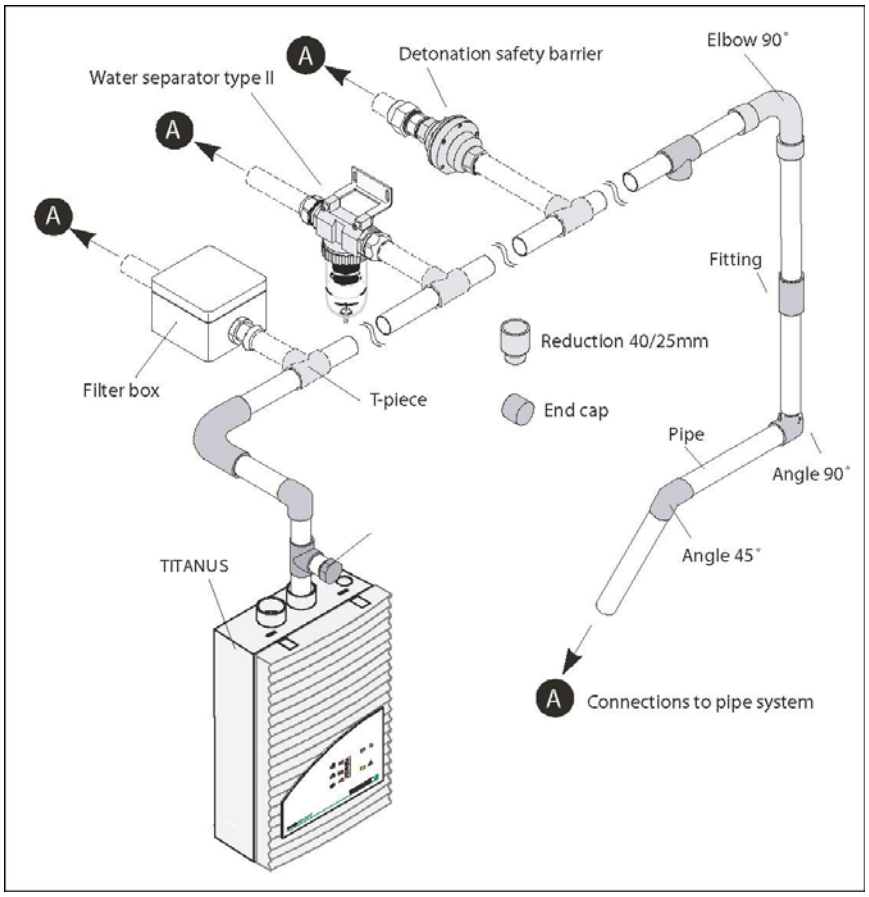


Fig. 2.8: Device mounting (1) for the TITANUS *TOP · SENS*® smoke extraction system

The TITANUS *TOP · SENS*® can be mounted directly on a wall. If necessary, for example for mounting on shelf racks, additional brackets are available.

2.3 Pipe System



During planning, there is a distinction made between space monitoring and equipment monitoring. For both applications, PVC pipes and halogen-free pipes can be used. For equipment monitoring, halogen-free pipes should be used.

Fig. 2.9 shows essential accessory components, that can be selected for the appropriate application.

For the construction of the pipe system, pipes with an exterior diameter of 25 mm and the appropriate fittings must be used.

If the maximum permissible pipe lengths are used, then for the pipe returns, pipes with an exterior diameter of 40 mm and the appropriate fittings must be used (see also Chapter 4.6.3 “Planning with Long Pipe Returns”).

Blowing-Out System

In areas in which dust particles or icing are possible, the blowing-out of the suction pipe system and its suction openings can become necessary. Fig. 2.10 shows a manual blowing-out system using a 3-way ball valve.

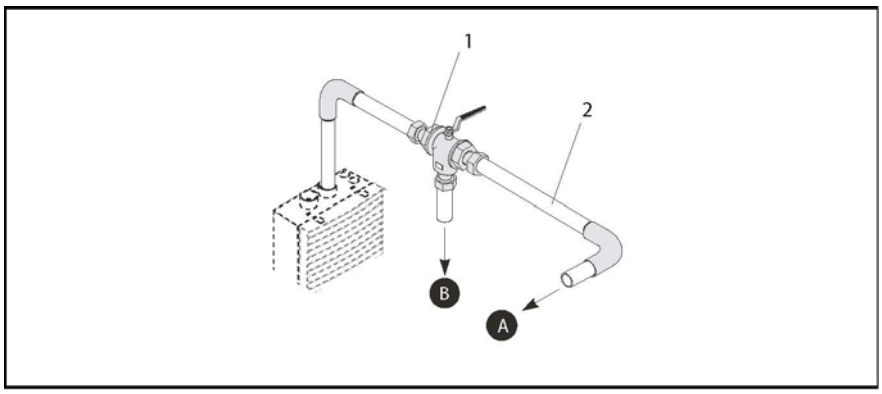


Fig. 2.10: Components of a manual blowing-out system

1 3-way ball valve
2 Suction pipe
A Compressed air supply
B Pipe system

2.3.1 Suction Openings

Suction-Reducing Film Sheets

A suction opening is a 10 mm boring in the suction pipe that is covered with a patented suction-reducing film sheet of the required opening diameter. The size of the opening depends on the construction of the pipe system (see Chapter 4, “Planning”).

To prevent displacement of the suction-reducing film sheet, it is secured with marking tape . The marking tape is a transparent sticky film with red edges and a 10mm large hole. It is stuck over the suction-reducing film sheet so that the suction opening is not covered and it is also visible from great distances.

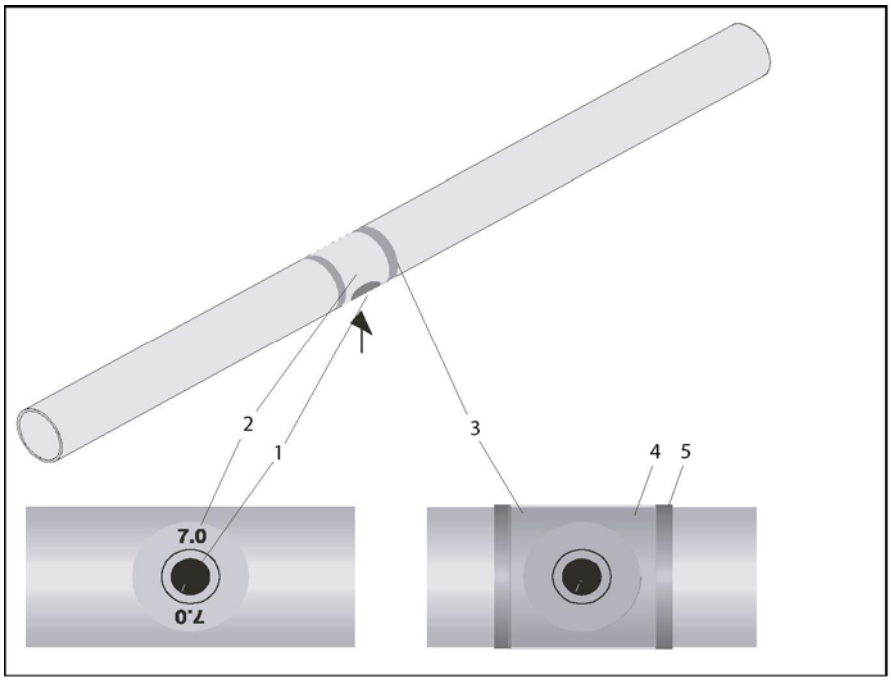


Fig. 2.11: Suction opening with suction-reducing film sheet and marking tape

1 Suction opening
2 Suction reducing film sheet
3 Marking tape
4 Color: transparent
5 Color: fire red, RAL 3000

Suction-Reducing Clips

The suction openings that are used in areas where blockages can be expected are equipped with a patented RAS suction clip, which includes flexible suction reduction (see Fig. 2.12).

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

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

When planning in areas with environmental influences that make a blowing-out system necessary (e.g. dust), the suction reducers with plastic clips are preferred to the suction-reducing film sheets with marking tape. The reason for this is that the openings can be blown out

better. In addition, the clips are more stable under pressure and the cleaning effect is much better due to the elastic rubber insert.

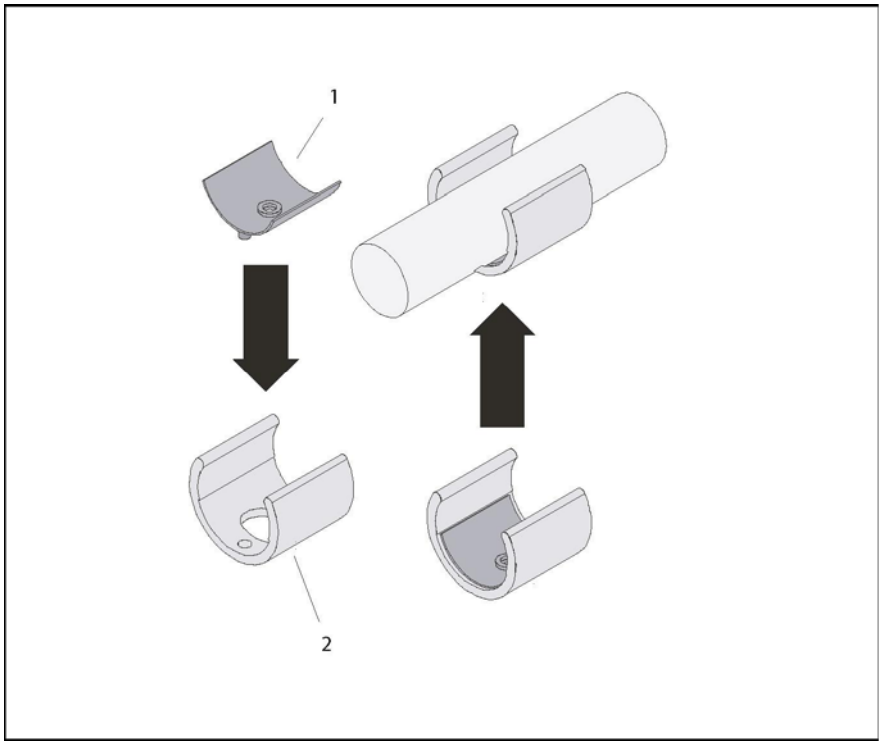


Fig. 2.12: Suction reduction for soiled areas and deep-freeze areas

1 Suction reducer for deep freeze areas
2 Plastic clip

The suction reducers with plastic clips are available separately.

2.3.2 Air Return for Pressure Areas and Atmospheric Loads

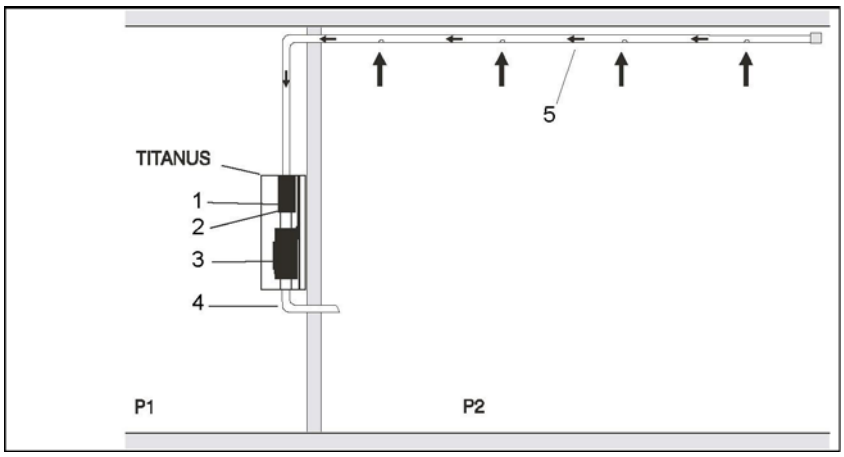


Fig.2.13: Principle of air return with the TITANUS *TOP · SENS*®

1 Detector module
2 Airflow sensor
3 Suction unit
4 Air return
5 Pipe system

If the TITANUS *TOP · SENS*® and the pipe system are installed in areas with different air pressure, the air taken in in the pressure area of the pipe system must be returned (see Fig.2.13).
The air return can serve to equalize pressure or to prevent atmospheric loads (e.g. odors) in neighboring spaces.

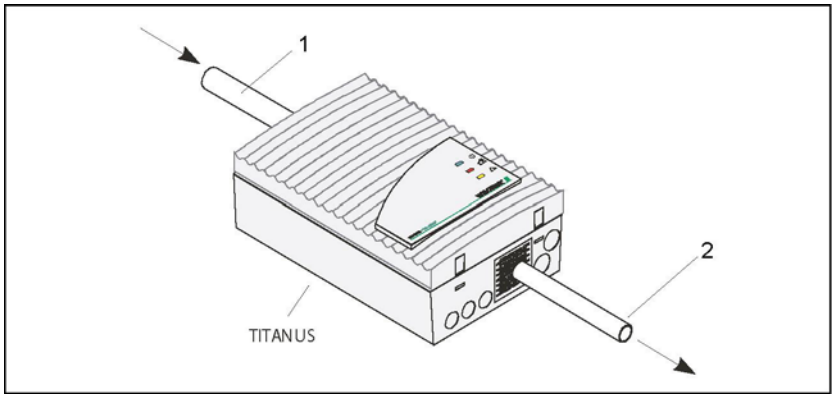


Fig. 2.14: TITANUS TOP · SENS® with suction pipe (1) and air return (2)

The air-return pipe is connected directly through the ventilation grille to the air-exhaust duct in the inside of the TITANUS *TOP · SENS*® (see Fig. 2.14). For this, the pre-punched opening in the protective grille must be punched out.

NOTE

The air return of the smoke extraction system should not exceed 2 m. Longer returns must be checked individually.

2.3.3 Water Separator for Humid Areas

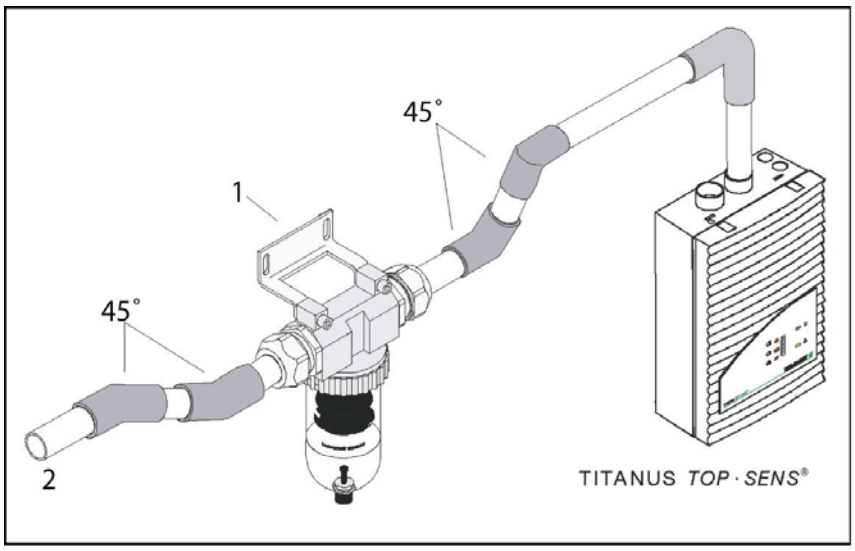


Fig. 2.15: Water separator type II (1) for condensing water vapor and collecting condensation from the pipe system (2)

Areas of Application

If the TITANUS *TOP · SENS*® is operated in environments where condensation can form in the extraction system, a water separator is used. The formation of condensation can occur with sharp temperature fluctuations and in areas with fresh-air monitoring.

There are two different water separators available:

- Standard water separator for spaces with high humidity
- Water separator type II for spaces with very high humidity

The standard water separator is installed in an ascending part of the pipe system with a connection to the suction pipe towards the bottom and a connection to the TITANUS T*OP · SENS*® via a PG29 screw connection towards the top. The condensation occurs on the false floors, over which the humid air flows in two directions.

The water separator type II is installed at the lowest point of the pipe system between the air filter and the smoke extraction system. The 45° angles allow optimal distance from the wall (see Fig. 2.15).

The water separator type II can be operated in a temperature range from 0°C to +50°C. The sinter filter in the water separator has a pore width of 50 µm and causes additional rough absorption of soil particles.

2.3.4 Detonation Safety Barrier for Areas in Danger of Explosion

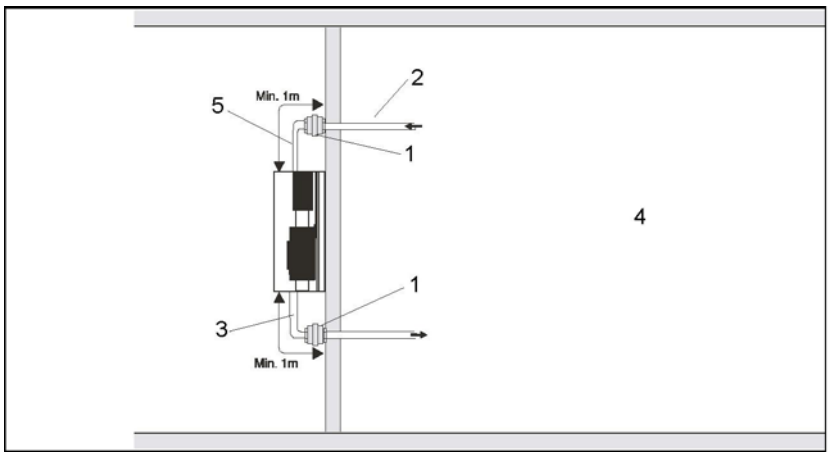


Fig. 2.16: Detonation safety barrier (1) in extraction pipe system and, if necessary, in the air return

1 Detonation safety barrier
2 Pipe system
3 Metal pipe
4 Explosive area

In case of ignition of steam/air mixtures or gas/air mixtures in the TITANUS *TOP · SENS*®, pipe explosions or detonations can occur. This depends on the composition, concentration, temperature, and pressure of the flammable mixture.

The detonation safety barrier is a flame trap, that is flame-proof in the face of pipe explosions (deflagrations) and detonations (see Fig. 2.16).

In normal operation, the steam and gas mixtures flow in any direction through the safety barrier. In case of an ignition of the mixture in the upstream smoke extraction system, the existing detonation is arrested. The ignition is prevented by the flame filter . If combustion of the mixture occurs in the flame filters, a rebound of the detonation front may occur. To prevent this, a minimum pipe length of **1.0 m** between the installation point of the detonation safety barrier and a possible ignition source (smoke suction system) must be maintained. Permanent fire prevention is thus achieved indirectly.

NOTE

The connecting pipe between the smoke extraction system and the detonation safety barrier must be made of metal. During installation, be sure that the threaded connections are bolted together gas-tight using synthesol or a sealing band.

Type	**PROTEGO DA-G DN - IIC**
Explosion groups	I + II
Connections	PG 29 screw connections
Operating pressure (max.)	1.1 bar
Approval	German Federal Institute for Material Testing

2.3.5 Scope of Delivery: Smoke Extraction System

Basic Devices and Accessories

Designation	Reference number
Basic device TITANUS *TOP · SENS*® TT-1	4.998.143.397
Basic device TITANUS *TOP · SENS*® TT-2	4.998.143.398
Detector module TITANUS *TOP · SENS*® DM-TT-80	4.998.143.400
Detector module TITANUS *TOP · SENS*® DM-TT-25	4.998.143.401
Detector module TITANUS *TOP · SENS*® DM-TT-05	4.998.143.402
Device mounting for smoke extraction systems MT-1	4.998.143.410
DIAG diagnostic software	4.998.143.412
Test pipe	4.998.148.848
Test adapter	4.998.148.849

Pipe Components

Designation	Reference number
PVC transparent hose, exterior ∅ 25 mm	2.799.330.762
Polywell hose PG16, flexible, black	4.998.121.071
PVC ring nut, M20	4.998.121.072
PVC quick-close coupling, straight, M20	4.998.121.076
PVC quick-close coupling, angled, M20	4.998.121.077
PVC 3-way ball valve, for pipe exterior ∅ 25 mm	4.998.121.068
PVC flange for ventilator duct	4.998.121.069
Dust collector, for pipe exterior ∅ 25 mm	4.998.121.063
Detonation safety barrier, for pipe exterior ∅ 25 mm	4.998.121.062
Water separator, for pipe exterior ∅ 25 mm	4.998.121.060
Water separator type II PVC, exterior ∅ 25 mm	4.998.121.061
Filter box small, for pipe exterior ∅ 25 mm	4.998.121.064
Replacement filter mat for filter box small	4.998.121.066
Filter box large, for pipe exterior ∅ 25 mm	4.998.121.065
Replacement filter mat for filter box large	4.998.121.067

Components for Suction Openings

Designation	Reference number
Marking tape suction-reduction film sheet AF-BR, 10pcs	4.998.143.413
Suction-reduction film sheet 2.0 mm AF-2.0, 10pcs	4.998.143.416
Suction-reduction film sheet 2.5 mm AF-2.5, 10pcs	4.998.143.417
Suction-reduction film sheet 3.0 mm AF-3.0, 10pcs	4.998.143.418
Suction-reduction film sheet 3.2 mm AF-3.2, 10pcs	4.998.143.419
Suction-reduction film sheet 3.4 mm AF-3.4, 10pcs	4.998.143.420
Suction-reduction film sheet 3.6 mm AF-3.6, 10pcs	4.998.143.422
Suction-reduction film sheet 3.8 mm AF-3.8, 10pcs	4.998.143.423
Suction-reduction film sheet 4.0 mm AF-4.0, 10pcs	4.998.143.424
Suction-reduction film sheet 4.2 mm AF-4.2, 10pcs	4.998.143.425
Suction-reduction film sheet 4.4 mm AF-4.4, 10pcs	4.998.143.426
Suction-reduction film sheet 4.6 mm AF-4.6, 10pcs	4.998.143.427
Suction-reduction film sheet 5.0 mm AF-5.0, 10pcs	4.998.143.428
Suction-reduction film sheet 5.2 mm AF-5.2, 10pcs	4.998.143.429
Suction-reduction film sheet 5.6 mm AF-5.6, 10pcs	4.998.143.430
Suction-reduction film sheet 6.0 mm AF-6.0, 10pcs	4.998.143.431
Suction-reduction film sheet 6.8 mm AF-6.8, 10pcs	4.998.143.432
Suction-reduction film sheet 7.0 mm AF-7.0, 10pcs	4.998.143.433

NOTE

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

3 Technical Data

NOTE

All specified current consumption relates to an ambient temperature of 20°C.

3.1 TITANUS *TOP · SENS*®

		TITANUS *TOP · SENS*® TT-1		TITANUS *TOP · SENS*® TT-2	
Voltage	Supply voltage (U_e)	14 to 30 V DC			
	Rated supply voltage	24V DC			
Current		U_L[1]= 6,9 V	U_L = 9 V	U_L = 6.9 V	U_L = 9 V
	Starting current (at 24 V)	300 mA		350 mA	
	Current consumption stand-by (at 24 V)	230 mA[2]	300 mA	275 mA	340 mA
	Current consumption alarm (at 24 V)	max. 300 mA	max. 360 mA	max. 350 mA	max. 430 mA
	Contact load capacity of the alarm and malfunction relay breaking capacity	30 V, 1 A max. 24 W			
	Integrated coupler	1 fire control interface		1 fire control interface and 1 fire interface	
Acoustic power level	L_{wa} in compliance with EN 27779, 1991	45 dB(A)			
Dimensions	Dimensions (H x W x D mm)	113 x 200 x 292 mm			
Weight	Weight	1.6 kg		1.7 kg	
Protection class	Protection class (DIN IEC 34 part 5)	IP 20			
Housing	Material	Plastic (ABS)			
	Color	papyrus white, RAL 9018			

[1] U_L = blower voltage
[2] The current values can deviate depending on the pipe system used.

		TITANUS *TOP · SENS*®TT-1	**TITANUS *TOP · SENS*® TT-2**
Conditions of use	Temperature range	0° to +50°C	
	Rel. humidity (non-condensing)	10 to 95 %	
Blower	Construction type	radial	
	Lifespan of the blower (12 V)	43,500 hour at 24°C	
Displays on the device	Display of the smoke level	Level display with 10 segments	2 level displays with ever 10 segments
	Alarm	Red alarm display for info-, pre- and fire alarm	2 red alarm displays for info-, pre- and fire alarm
	Malfunction	Yellow collective malfunction	
	Operation	Green operation display	
Connections	Device connection	Clamps for max. 1.5 mm² strands	
	Cable	Twisted in pairs, shielded or unshielded	
	Cable entry points	1 x M 20 2 x M 25	
	Conical pipe connections	1 x for pipe ∅ 25 mm 1 x for air return ∅ 25 mm	2 x for pipe ∅ 25 mm 1 x for air return ∅ 25 mm
Response sensitivity	Detector module DM-TP-80 …	max. light obscuration 0.8 %/m	
	Detector module DM-TP-25 …	max. light obscuration 0.25 %/m	
	Detector module DM-TP-05 ...	max. light obscuration 0.05 %/m	
Approval	VdS approval number	G 20 40 83	

3.2 Pipe System – TITANUS *TOP · SENS*®

Pipe System

	TITANUS *TOP · SENS*® TT-1	**TITANUS *TOP · SENS*®TT-2**
max. pipe length max. number of suction openings	180 m 24	360 m 48
max. length suction hose per ceiling entry point	1 m	
Temperature range PVC pipe ABS pipe	-10°C..+60°C -40°C..+80°C	
max. monitoring space	2880 m^2	5,760 m^2

4 Planning

Chapters 4.2 and 4.3 will describe the planning for the pipe system and the airflow monitoring. Chapter 4.4 treats the specification of the sensitivity and Chapter 4.5 the planning limits. With standard requirements for airflow monitoring, the standard planning described in Chapters 4.6.2 – 4.6.4 should be selected. If more sensitive airflow monitoring is needed, then the planning with single-hole monitoring described in Chapter 4.6.5 applies. Chapter 4.7 describes the guidelines for planning with forced airflow.

4.1 Regulations

The following planning instructions are oriented towards the system limits of the TITANUS *TOP · SENS*®. Here, the corresponding national regulations of the countries in their respectively-applicable version must be adhered to and planning must be adjusted to these.

In **Germany**, the following regulations must be adhered to:

- DIN VDE 0833 parts 1 and 2 "Sec. sys 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.

For **VdS systems**, the following guidelines must also be adhered to:

- "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)

For **CEA requirements**, the following guidelines must also be adhered to:

- The CEA guideline demands the recognition of an airflow malfunction if a 50% change of the main airflow occurs. In addition, the size of the suction openings is specified at a minimum ø 2,0 mm

During **planning**, the following guidelines must also be adhered to:

- The planning limits described in Chapter 4.5 apply.
- The maximum monitoring space of a suction opening is 120 m².

4.2 Pipe System

The suction mains must be designed such that all possible fires in the monitoring area can be dealt with in the early stage.

The number of suction openings and the construction of the pipe system depends on the size and geometry of the monitoring area. The pipe system must be laid out according to the planning guidelines in this chapter, taking into account the following issues:

Symmetrical construction

Preferably, the pipe system should be laid out **symmetrically**, that is:

- same number of suction openings per pipe branch
- same pipe branch lengths (should not exceed ± 10% deviation)
- same distance between neighboring suction openings on the smoke extraction pipe (should not exceed ± 10% deviation)

Asymmetrical construction

If the pipe system must be laid out asymmetrically due to circumstances of construction (see Fig. 4.1), the following conditions apply:

- the number and length of the suction openings of the shortest and longest pipe branch of the pipe system may not exceed a ratio of **1:2**.
- the distance between neighboring suction openings on the smoke extraction pipe must be equal (should not exceed ± 20% deviation)
- the diameter of the suction openings are determined separately for each pipe branch. they depend on the total number of suction openings on the respective pipe branch.

Fig. 4.1 shows an example of a U pipe system with 3 or 6 suction openings and the diameters of the suction openings calculated according to Chapter 4.6.2 “Standard Planning.“

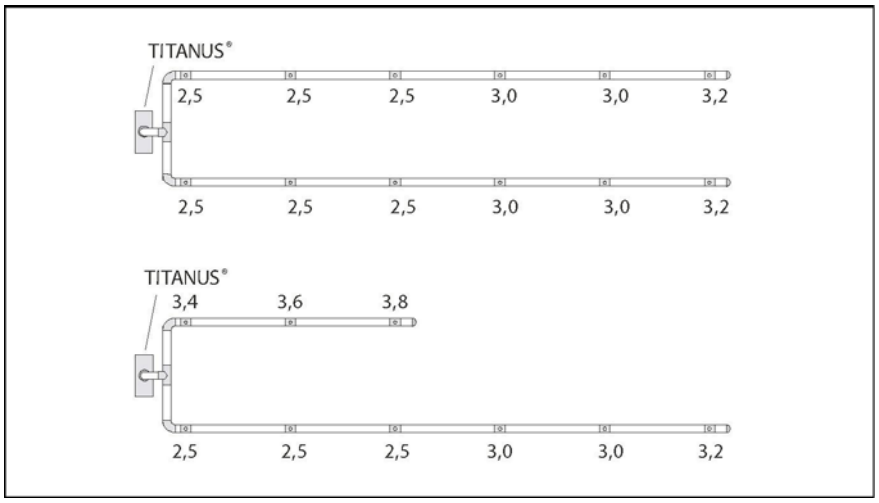


Fig. 4.1: Example of a symmetrical (above) and an asymmetrical (below) U pipe system

Longer pipe feed lines

In many application cases, larger distances between the smoke extraction system and the suction pipe must be bridged. For this, pipe feed lines with larger diameters are used in order to guarantee a maximum planning (see also Chapter 4.6.3 “Planning with Long Pipe Feed Lines").

Branch lengths

To achieve short transport times for the smoke aerosoles in the suction 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 geometry of the room, 3 pipe configurations can be selected (see Fig. 4.2):

- I-pipe: Pipe system without branchings.
- U-pipe: Pipe system that branches into 2 pipe branches.
- Double-U-pipe: Pipe system that branches symmetrically into 4 pipe branches.

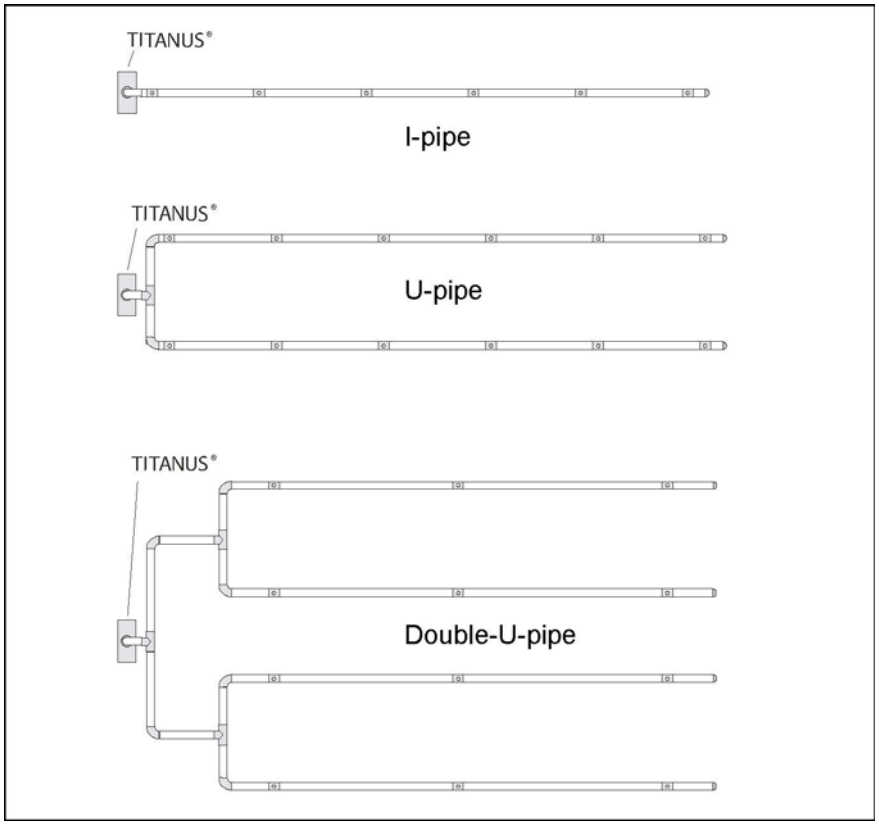


Fig. 4.2: Pipe configurations

Change of direction

Angles and bends in the pipe system increase the flow resistance. Therefore, they should only be used where, due to building-technical reasons, they cannot be avoided.

NOTE

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

Special cases If the pipe system does not correspond to the planning guidelines described here due to building-technical circumstances, it must be calculated separately for the case in question on request.

Testing For critical applications, test the secure detection with activation attempts. Check also whether there is airflow to the individual suction openings.

TIP

To increase the transport speed in critical areas of the pipe system, the blower voltage can be increased from 6.9 V to 9 V.

Two-detector dependency One suction line must be assigned per detector module. Both detector modules of a device must be evaluated independently of one another. Per smoke extraction system only one extinguishing area may be monitored.

Fig. 4.3: Pipe configurations for two-detector dependency

4.3 Airflow Monitoring

The planning of airflow monitoring of the smoke extraction pipes is selected taking into account the respective national regulations for the country in question.

CEA requirement The CEA 4022 "Requirements and test methods for aspirating smoke detectors" requires that a smoke extraction system notifies of an airflow malfunction if there is a 50% change in the main airflow.

If with a blockage of 50% of all existing suction openings an airflow malfunction is detected, thus the recognition of a 50% change in the main airflow is guaranteed.

Regardless of this CEA requirement, areas can be monitored with the TITANUS *TOP · SENS*® that

- due to the organization of the monitoring areas require single-hole monitoring,
- require a break recognition that causes the drop-off of 50% of the suction openings present in the pipe system.

Gradation of the suction openings For even detection, it is necessary that all suction openings have nearly the same air flow rate. For this reason, with large distances between the suction

openings (> 4 m), the boring diameter to the pipe end must be larger. For the respective diameters, see the tables in Chapters 4.6.2 – 4.6.5.

Adjustment of the airflow sensitivity

The sensitivity of the airflow sensor must be adjusted to the application case. For example, a long pipe system requires a sensitive setting of the airflow sensor. The activation threshold and thus the sensitivity of the airflow sensor can be set on 4 levels.

Level	**I**	**II**	**III**	**IV**
Activation threshold	small	medium	large	very large
Sensitivity	very high	high	medium	low

TIP

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

Restrictions

The airflow monitoring may only be set to level 1 if the pipe system has been planned in accordance with Chapter 4.6.5 Single-Hole Monitoring. Level II may only be set if the pipe system is structured symmetrically and the airflow sensor is equalized depending on the air pressure (see Chapter 7.1.2 "Air Pressure-Dependent Calibration").

NOTE

With **asymmetrically**-structured pipe systems, only the levels III to IV of the airflow monitoring may be set.

Level IV of the activation threshold can also be set to exclude particularly large air-pressure fluctuations. With this threshold, the airflow monitoring is so insensitive that a blockage is only recognizable if it causes at least a 50% change in the main airflow.

Air pressure differences

There must be equivalent air pressure along the suction pipe.

NOTE

If the smoke extraction system and pipe system are in areas with different air pressure, then a return of the air sucked in by the TITANUS *TOP · SENS*® must be provided in the pressure area of the pipe system (see Chapter 2.3.5 “Air Return“).

4.4 Specifying the Sensitivity

The response sensitivity at the individual detection points (smoke extraction openings) depends on the detector module used, the sensitivity level set, and the number of detection points. It is calculated from:

$$S_{DP} = S_{TOPSENS} \times N_{proj.DP}$$

S_{DP} = *Sensitivity of the individual detection point (smoke extraction opening, pure calculation value)*

$S_{TOPSENS}$ = selected detector module sensitivity of TITANUS *TOP · SENS*®

$N_{proj.\ DP}$ = *number of all planned detection points in the system per detector module*

The table shows the selectable sensitivity levels of the three detector modules of the TITANUS *TOP · SENS*®. The default settings are shaded gray.

Response Sensitivity (Alarm) TITANUS *TOP · SENS*®		
Detector module DM-TT-05	**Detector module DM-TT-25**	**Detector module DM-TT-80**
0.4 % light obscuration/m	2 % light obscuration/m	not occupied
0.2 % light obscuration/m	1 % light obscuration/m	not occupied
0.1 % light obscuration/m	0.5 % light obscuration/m	1.6 % light obscuration/m
0.5 % light obscuration/m	0.25% light obscuration/m	0.8 % light obscuration/m

The planning always occurs according to the instructions for point-type smoke detectors.

NOTE

Here it must be ensured that the **sensitivity of the individual detection point S_{DP}** achieves at least a value of **≤ 3.5 %/m light obscuration**.

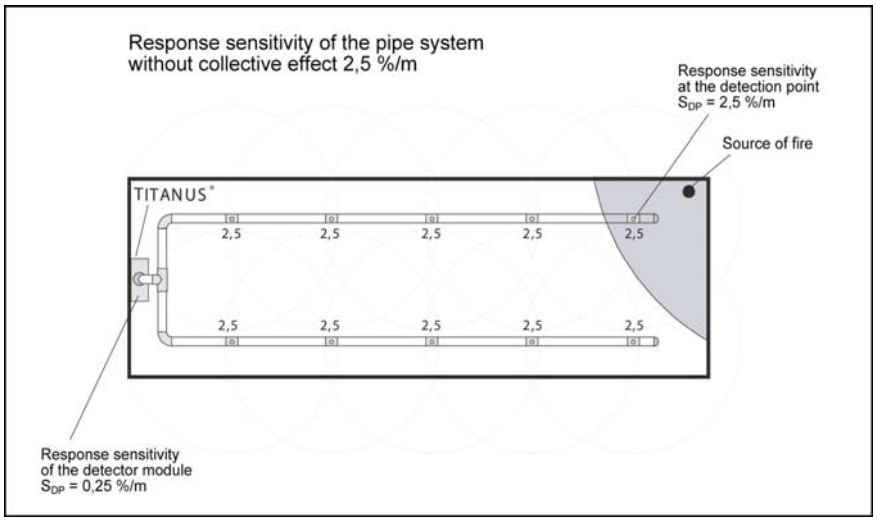
NOTE

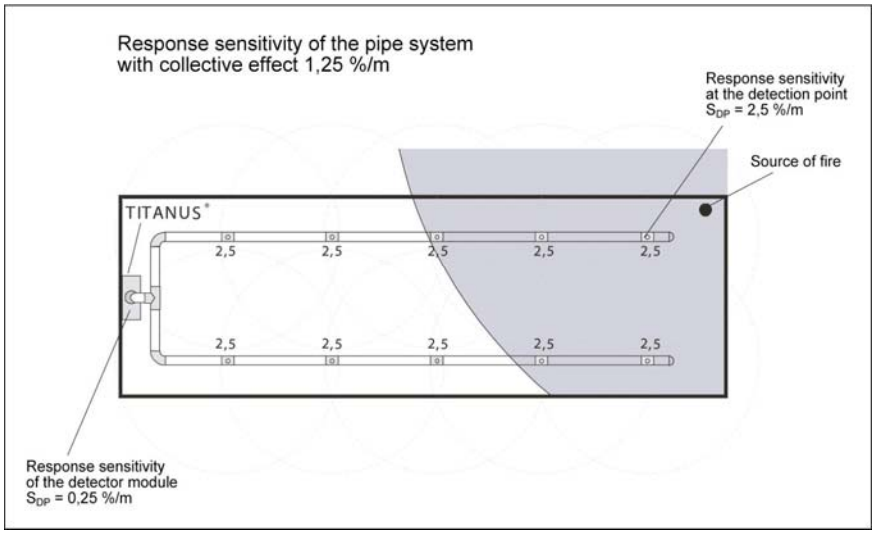
When monitoring several areas with a smoke extraction system, the **total sensitivity of the suction openings within a closed area** must amount to **≤ 3.5%/m light diffusion**.
If this value is not reached, it is recommended that a higher sensitivity be set.

Collective effect

When monitoring individual larger areas, the so-called collective effect occurs. With point-type smoke detectors, the detection quality depends on the sensitivity set in the detector. With smoke extraction systems, by contrast, the response sensitivity depends on the number of suction openings supplied with smoke. The actual sensitivity lies, depending on the course of the fire and environmental conditions, between the calculated sensitivity at the detection point and that in the detector module. The response sensitivity with respect to the individual detection point will improve significantly with smoke extraction systems in case of a spreading fire since it can be assumed that ever more suction openings (see Fig. 4.6) will be supplied with smoke simultaneously.

With the collective effect, the response sensitivity in an extreme case can achieve the value of the detector module with a supply of all suction openings.





ig 4.5/4.6: Example of detection without collective effect (above) and with collective effect (below)

4.5 Planning Boundaries

The following boundary values must always be adhered to with the TITANUS *TOP · SENS*®:

- the minimum pipe length between 2 suction openings is **0.1 m**.
- the maximum pipe length between 2 suction openings is **12 m**.
- the maximum monitoring space per suction opening is **120 m²** for the detector modules DM-TP-05 and DM-TP-25 and **60 m²** for the detector module DM-TP-80.
- a maximum of **24** suction openings per pipe system[1] are possible[2].

The maximum total monitoring space of the TITANUS *TOP · SENS*® and the maximum total pipe length depends on the planning selected.

Airflow Monitoring	**Maximum total monitoring space [3] per TITANUS *TOP · SENS*®**	**Max. pipe length[3]**
Airflow monitoring according to VdS guideline	2,880 m²	180 m
Airflow monitoring according to planned single-hole monitoring	1,680 m²	140 m

With the TITANUS *TOP · SENS*® TT-2, 2 pipe systems with the maximum values specified in the table may be operated. These values apply per pipe system.

After selecting the airflow monitoring and the associated planning boundaries, these must be checked against limitations by country-specific regulations!

[1] With the TITANUS *TOP · SENS*® TT-2 having two pipe systems, max. 48 suction openings.
[2] Plans/project forms that are not described in the manual should be requested.
[3] Depending on the planning selected, some restricted values may apply.

4.6 Standard Planning

4.6.1 Planning of the Detection Points

NOTE

If the planning on location deviates from the standard plans described below, then it must in any case be checked with activation attempts for the correct recognition of a malfunction and a fire.
Otherwise, a special plan is required.

4.6.2 Standard Pipe Planning

The next 3 pipe configurations are basic models for secure detection in the monitoring area according to VdS guidelines.

If the pipe length to be planned is no longer than 40 – 100 m and the maximum distance between the suction openings is not more than 4 m, then the simplified plan (Chap. 4.6.4) can be used. This plan, for example, is preferred for equipment protection.

If, by contrast, for pipe planning the monitoring of individual suction openings is necessary, then the plan with single-hole monitoring (Chap. 4.6.5) must be used.

4.6.2.1 I-Pipe System

1 pipe system
TITANUS *TOP · SENS*®
TT-1

2 pipe systems
TITANUS *TOP · SENS*®
TT-2

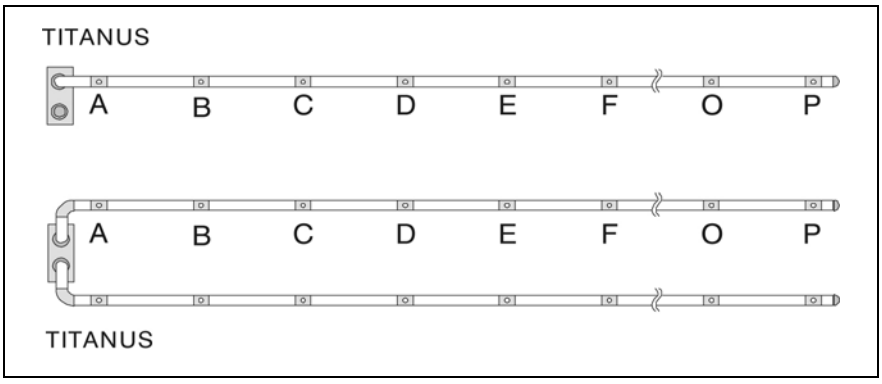


Fig. 4.7: I-pipe system for space protection

Boundary values

Min. distance TITANUS® – 1st suction opening	4 m
Max. distance TITANUS® – 1st suction opening	20 m
Max. distance 1st suction opening -- last suction opening - with small blower voltage - with larger blower voltage	 60 m 80 m
Max. total pipe length per pipe system - with small blower voltage - with larger blower voltage	 80 m 100 m
Min. distance between 2 suction openings	4 m
Max. distance between 2 suction openings	12 m
Max. number of suction openings (n) per pipe system	16

Suction openings

Number of openings	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
∅ Suction opening in mm[4])								
A	6.0	5.0	4.2	3.8	3.2	3.0	2.5	2.5
B	6.8	5.2	4.4	3.8	3.2	3.0	2.5	2.5
C	—	5.2	4.6	4.0	3.6	3.0	3.0	2.5
D	—	—	4.6	4.0	3.6	3.4	3.0	3.0
E	—	—	—	4.4	4.0	3.4	3.4	3.0
F	—	—	—	—	4.0	3.8	3.4	3.4
G	—	—	—	—	—	3.8	3.8	3.4
H	—	—	—	—	—	—	3.8	3.8
I	—	—	—	—	—	—	—	3.8

Suction openings

Number of openings	**10**	**11**	**12**	**13**	**14**	**15**	**16**
∅ Suction opening in mm[4])							
A	2.0	2.0	2.0	2.0	2.0	2.0	2.0
B	2.0	2.0	2.0	2.0	2.0	2.0	2.0
C	2.5	2.0	2.0	2.0	2.0	2.0	2.0
D	2.5	2.5	2.5	2.0	2.0	2.0	2.0
E	3.0	2.5	2.5	2.5	2.5	2.5	2.5
F	3.0	3.0	2.5	2.5	2.5	2.5	2.5
G	3.4	3.0	3.0	2.5	2.5	2.5	2.5
H	3.4	3.4	3.0	3.0	2.5	2.5	2.5
I	3.6	3.4	3.0	3.0	3.0	3.0	3.0
J	3.6	3.6	3.4	3.0	3.0	3.0	3.0
K	—	3.6	3.4	3.4	3.0	3.0	3.0
L	—	—	3.4	3.4	3.4	3.0	3.0
M	—	—	—	3.4	3.4	3.4	3.4
N	—	—	—	—	3.4	3.4	3.4
O	—	—	—	—	—	3.4	3.4
P	—	—	—	—	—	—	3.4

[4] Punch diameter of the suction-reducing film sheet

4.6.2.2 U-Pipe System

1 pipe system
TITANUS *TOP · SENS*®
TT-1

2 pipe systems
TITANUS *TOP · SENS*®
TT-2

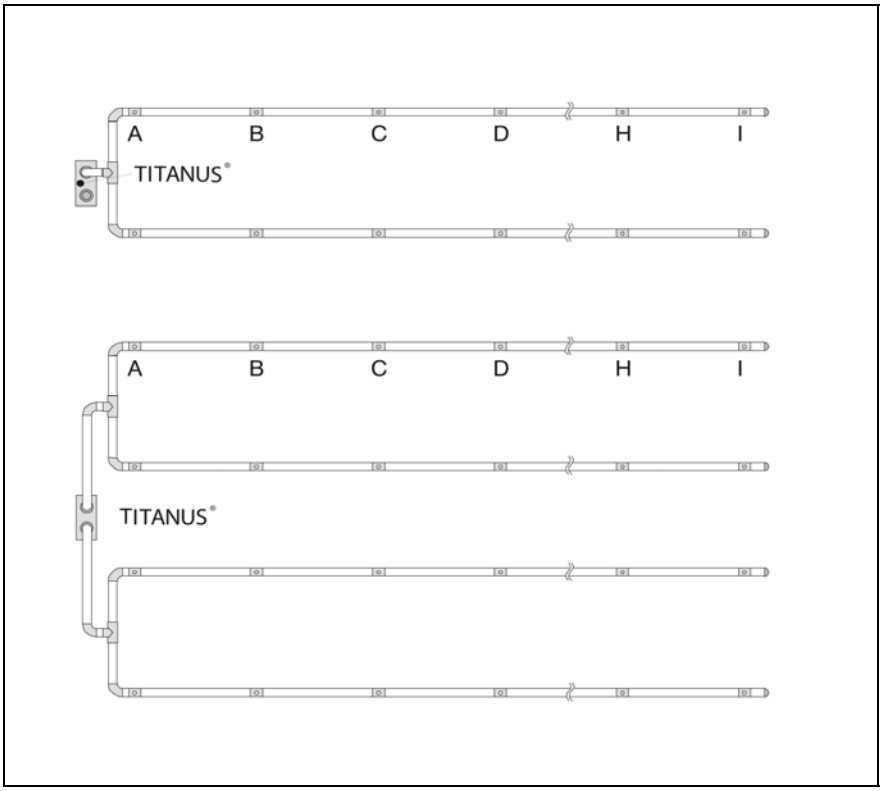


Fig. 4.8: U-pipe system for space protection

Boundary values

Min. distance TITANUS® – T piece	4 m
Max. distance TITANUS® – T piece	20 m
Max. branch length - with small blower voltage - with larger blower voltage	 60 m 70 m
Max. total pipe length per pipe system - with small blower voltage - with larger blower voltage	 140 m 160 m
Min. distance between 2 suction openings	4 m
Min. distance between 2 suction openings	12 m
Max. number of suction openings (n) per pipe system	18

Suction openings

Number of openings per pipe system	2	4	6	8	10
∅ Ansaugöffnung in mm[5])					
A	5.2	3.6	3.4	3.2	2.5
B	—	4.0	3.4	3.2	3.0
C	—	—	3.6	3.4	3.0
D	—	—	—	3.4	3.2
E	—	—	—	—	3.2
F	—	—	—	—	—
G	—	—	—	—	—

Suction openings

Number of openings per pipe system	12	14	16	18
∅ Suction opening in mm[5])				
A	2.5	2.0	2.0	2.0
B	2.5	2.0	2.0	2.0
C	2.5	2.5	2.0	2.0
D	3.0	2.5	2.5	2.0
E	3.0	3.0	2.5	2.5
F	3.2	3.0	3.0	2.5
G	—	3.2	3.0	2.5
H	—	—	3.0	3.0
I	—	—	—	3.0

[5] Punch diameter of the suction-reducing film sheet

4.6.2.3 Double-U-Pipe System

1 pipe system
TITANUS T*OP · SENS*®
TT-1

2 pipe systems
TITANUS *TOP · SENS*®
TT-2

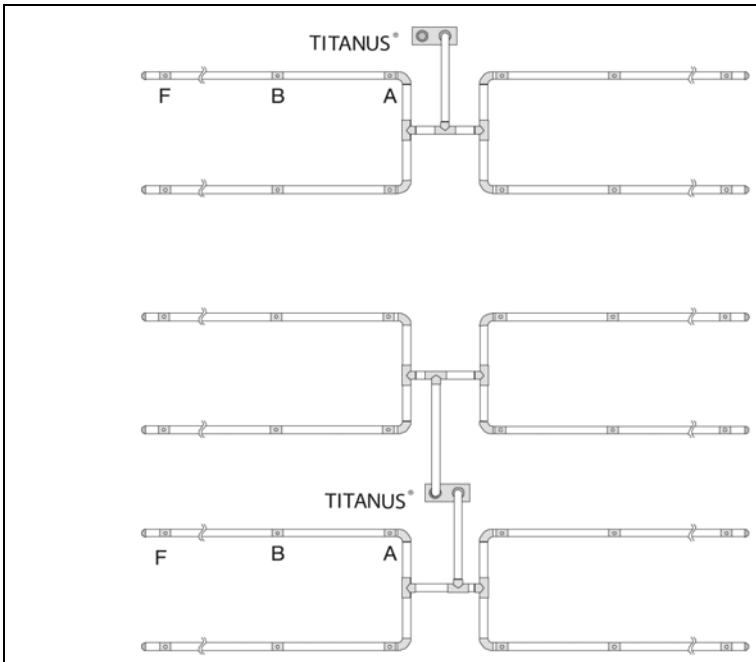


Fig. 4.9: Double-U-pipe system for space protection

Boundary values

Min. distance TITANUS® – last T piece	4 m
Max. distance TITANUS® – last T piece	20 m
Max. branch length with - smaller blower voltage - with larger blower voltage	 30 m 40 m
Max. total pipe length per pipe system - with small blower voltage - with larger blower voltage	 140 m 180 m
Min. distance between 2 suction openings	4 m
Min. distance between 2 suction openings	12 m
Max. number of suction openings (n) per pipe system	24

Suction openings

Number of openings per pipe system	**4**	**8**	**12**	**16**	**20**	**24**
∅ Suction opening in mm[6])						
A	4.0	3.0	2.5	2.0	2.0	2.0
B	—	3.4	3.0	2.5	2.0	2.0
C	—	—	3.0	3.0	2.5	2.0
D	—	—	—	3.0	2.5	2.5
E	—	—	—	—	3.0	2.5
F	—	—	—	—	—	3.0

[6] Punch diameter of the suction-reducing film sheet

4.6.3 Planning with Long Pipe Feed Lines

For planning, pipes with a diameter of 40 mm are used. This applies for the previously-depicted pipe configurations.

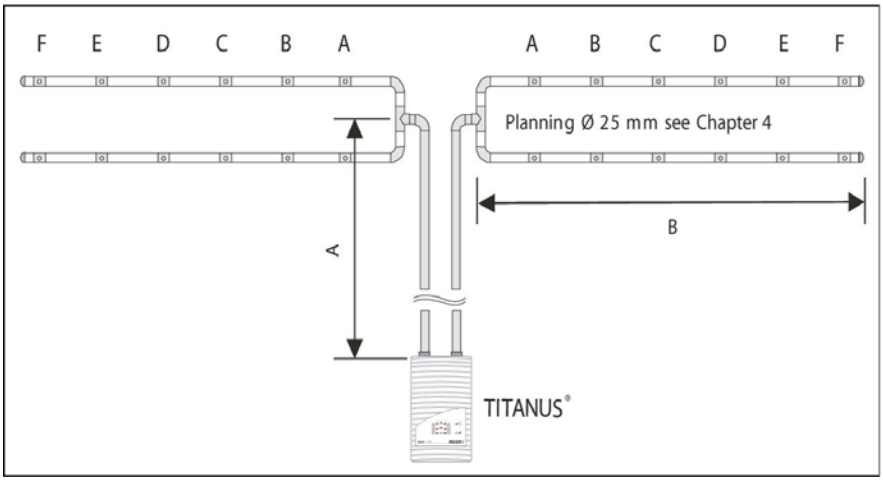


Fig. 4.10: Example of a pipe system with long pipe feed lines for space monitoring

For a pipe system for space monitoring, the following boundaries apply:

Pipe diameter	Max. length A		Max. length B	
	6.9V*	9V*	6.9V*	9V*
25mm	20m		60 m	80 m
40mm	60m			
* selected blower voltage, depends on the pipe system				

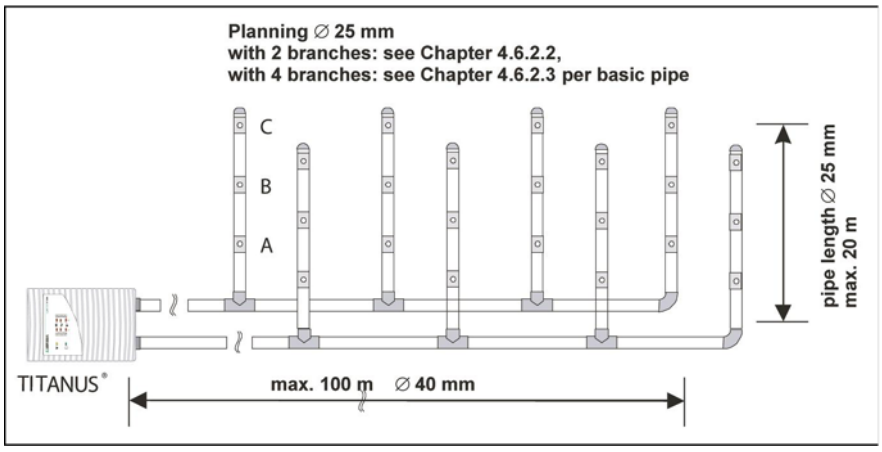


Fig. 4.11: Example of special planning for high-rack storage

For planning high-rack storage (Fig. 4.11), a basic pipe can be installed from which stitch-shaped suction pipes branch off.

The specifications for this pipe system are:

- max. pipe length 180 m (4 x 20 m branches + 100 m basic pipe)
- max. basic pipe length 100 m, basic pipe diameter 40 mm

4.6.4 Simplified Pipe Planning

The simplified planning is used for equipment protection and in spaces with small dimensions. The advantage of this planning is the uniform diameter of the suction openings.

4.6.4.1 I-Pipe System

1 pipe system TITANUS *TOP · SENS*® TT-1

2 pipe systems TITANUS *TOP · SENS*® TT-2

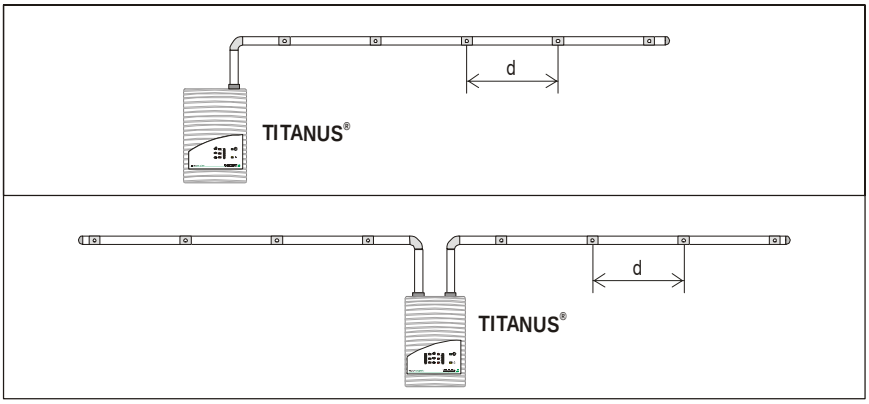


Fig. 4.12: I-pipe system, e.g. for equipment protection

Boundary values

Min. distance TITANUS® – 1st suction opening	2 m
Max. distance TITANUS® – 1st suction opening	20 m
Max. distance 1st suction opening -- last suction opening	20 m
Max. total pipe length Ø 25 mm	40 m
Max. number of suction openings (n) per pipe system	18
Minimum distance between the suction openings (d)	0.1 m
Maximum distance between the suction openings (d)	4 m

Suction openings

Number of openings	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
∅ All suction openings in mm[7)]	6.0	5.0	4.4	4.0	3.6	3.4	3.2	3.0	3.0

Suction openings

Number of openings	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
∅ All suction openings in mm[7)]	3.0	3.0	2.5	2.5	2.5	2.5	2.5	2.5

[7] Punch diameter of the suction-reducing film sheet

4.6.4.2 U-Pipe System

1 pipe system
TITANUS *TOP · SENS*®
TT-1

2 pipe systems
TITANUS *TOP · SENS*®
TT-2

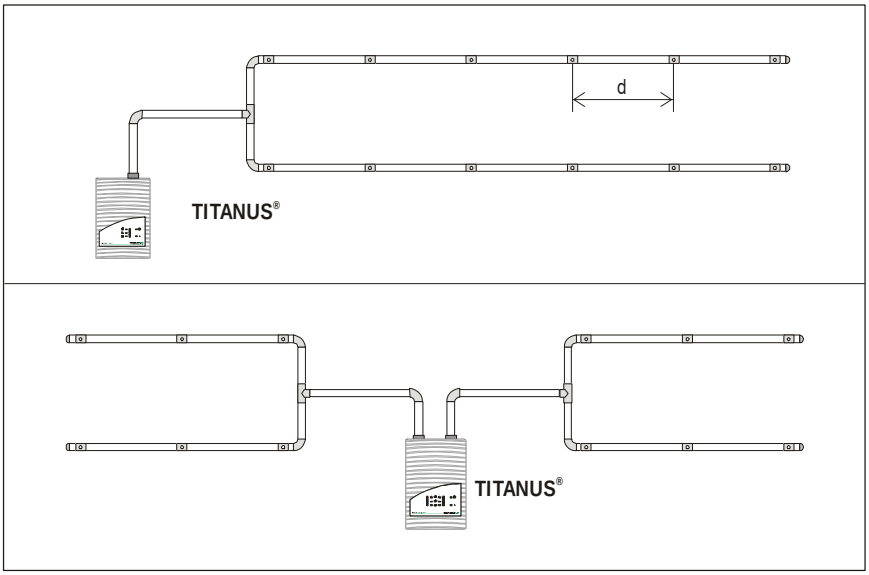


Fig. 4.13: U-pipe system, e.g. for equipment protection

Boundary values

Min. distance TITANUS® – T piece	2 m
Max. distance TITANUS® – T piece	20 m
Max. branch length	20 m
Max. total pipe length Ø 25 mm	60 m
Max. number of suction openings (n) per pipe system	18
Minimum distance between the suction openings (d)	0.1 m
Maximum distance between the suction openings (d)	4 m

Suction openings

Number of openings	**2**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**
∅ All suction openings in mm[8)]	6.0	4.4	3.6	3.2	3.0	3.0	2.5	2.5	2.5

[8] Punch diameter of the suction-reducing film sheet

4.6.4.3 Double-U-Pipe System

1 pipe system
TITANUS *TOP · SENS*®
TT-1

2 pipe systems
TITANUS *TOP · SENS*®
TT-2

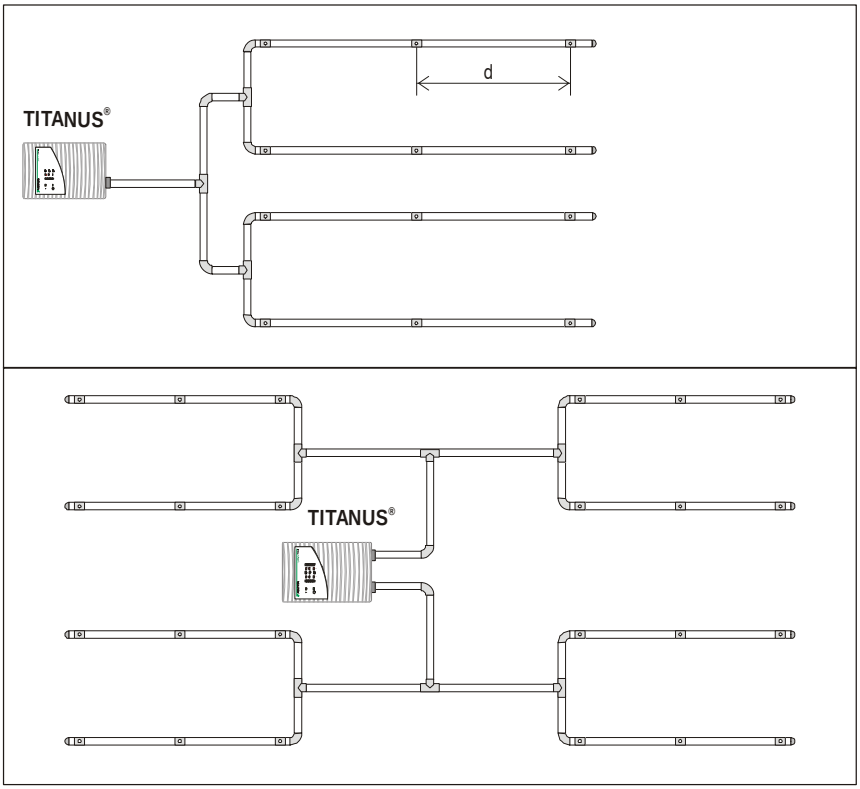


Fig. 4.14: Double--U-pipe system, e.g. for equipment protection

Boundary values

Min. distance TITANUS® – last T piece	2 m
Max. distance TITANUS® – last T piece	20 m
Max. branch length	20 m
Max. total pipe length Ø 25 mm	100 m
Max. number of suction openings (n) per pipe system	20
Minimum distance between the suction openings (d)	0.1 m
Maximum distance between the suction openings (d)	4 m

Suction openings

Number of openings per pipe system	**4**	**8**	**12**	**16**	**20**
∅ All suction openings in mm[9)]	4.0	3.4	3.0	2.5	2.0

[9] Punch diameter of the suction-reducing film sheet

4.6.5 Pipe Planning for Single-Hole Monitoring

4.6.5.1 I-Pipe System

1 pipe system
TITANUS *TOP · SENS*®
TT-1

2 pipe systems
TITANUS *TOP · SENS*®
TT-2

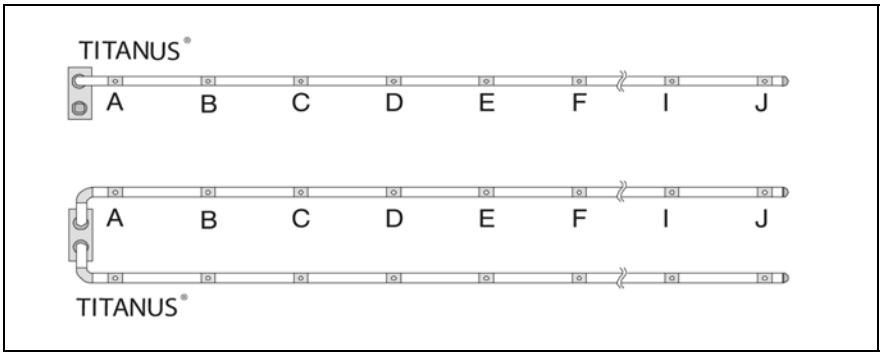


Fig. 4.15: I-pipe system for space protection

Boundary values

Min. distance TITANUS® – 1st suction opening	4 m
Max. distance TITANUS® – 1st suction opening	20 m
Max. distance 1st suction opening -- last suction opening - with small blower voltage - with larger blower voltage	 40 m 60 m
Max. total pipe length per pipe system - with small blower voltage - with larger blower voltage	 60 m 80 m
Min. distance between 2 suction openings	4 m
Max. distance between 2 suction openings	12 m
Max. number of suction openings (n) per pipe system	10

Suction openings

Number of openings	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
∅ Suction opening in mm[10])									
A	6.0	5.0	4.2	3.8	3.2	3.0	2.5	2.5	2.0
B	6.8	5.2	4.4	3.8	3.2	3.0	2.5	2.5	2.0
C	—	5.2	4.6	4.0	3.6	3.0	3.0	2.5	2.5
D	—	—	4.6	4.0	3.6	3.4	3.0	3.0	2.5
E	—	—	—	4.4	4.0	3.4	3.4	3.0	3.0
F	—	—	—	—	4.0	3.8	3.4	3.4	3.0
G	—	—	—	—	—	3.8	3.8	3.4	3.4
H	—	—	—	—	—	—	3.8	3.8	3.4
I	—	—	—	—	—	—	—	3.8	3.6
J	—	—	—	—	—	—	—	—	3.6

[10] Punch diameter of the suction-reducing film sheet

Activation Thresholds I-Pipe System

Activation threshold

Number of openings	2	3	4	5	6	7	8	9	10
1 blocked opening	III	III	II	I	I	—	—	—[11]	—
2 blocked openings	O[12]	O	III	III	II	I	I	—	—
3 blocked openings	O	O	O	O	III	III	II	I	I
4 blocked openings	O	O	O	O	O	O	III	II	I
5 blocked openings	O	O	O	O	O	O	O	O	II
… will be recognized by the setting level x									

Example

If the blockage of **3** suction openings of a total **of 7** suction openings should be recognized, then the switch for setting the airflow monitoring should be set to **level III**.

[11] — not possible

[12] O does not make sense

4.6.5.2 U-Pipe System

1 pipe system
TITANUS *TOP · SENS*®
TT-1

2 pipe systems
TITANUS *TOP · SENS*®
TT-2

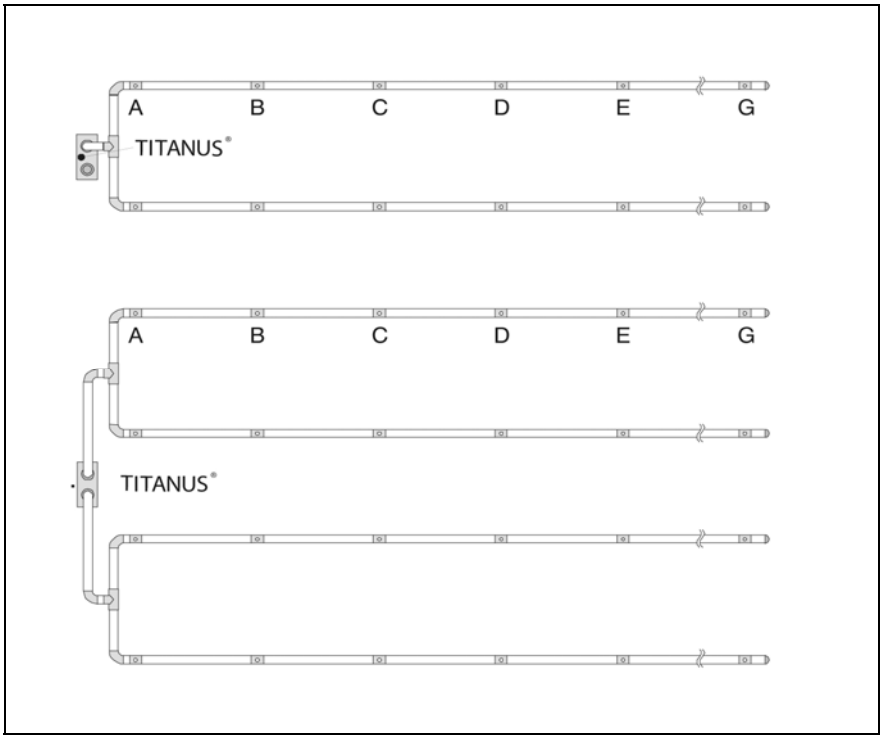


Fig. 4.16: U-pipe system for space protection

Boundary values

Min. distance TITANUS® – T piece	4 m
Max. distance TITANUS® – T piece	20 m
Max. branch length - with small blower voltage - with larger blower voltage	 40 m 50 m
Max. total pipe length per pipe system - with small blower voltage - with larger blower voltage	 100 m 120 m
Min. distance between 2 suction openings	4 m
Max. distance between 2 suction openings	12 m
Max. number of suction openings (n) per pipe system	14

Suction openings

Number of openings per pipe system	2	4	6	8	10	12	14
∅ Suction opening in mm[13])							
A	5,2	3,6	3,4	3,2	2,5	2,5	2,0
B	—	4,0	3,4	3,2	3,0	2,5	2,0
C	—	—	3,6	3,4	3,0	2,5	2,5
D	—	—	—	3,4	3,2	3,0	2,5
E	—	—	—	—	3,2	3,0	3,0
F	—	—	—	—	—	3,2	3,0
G	—	—	—	—	—	—	3,2

Activation Thresholds U-Pipe System per Pipe System

Activation thresholds

Number of openings	2	4	6	8	10	12	14
1 blocked opening	III	II	I	—[14]	—	—	—
2 blocked openings	O[15]	III	II	I	—	—	—
3 blocked openings	O	O	III	II	I	—	—
4 blocked openings	O	O	O	III	II	I	—
5 blocked openings	O	O	O	O	III	II	I
6 blocked openings	O	O	O	O	O	III	II
7 blocked openings	O	O	O	O	O	O	III
… will be recognized by the setting level x							

Example If the blockage of **3** suction openings of a total of **8** suction openings should be recognized, then the switch for setting the airflow monitoring should be set to **level II.**

[13] Punch diameter of the suction-reducing film sheet

[14] — not possible

[15] O does not make sense

4.6.5.3 Double-U-Pipe System

1 pipe system
TITANUS *TOP · SENS*®
TT-1

2 pipe systems
TITANUS T*OP · SENS*®
TT-2

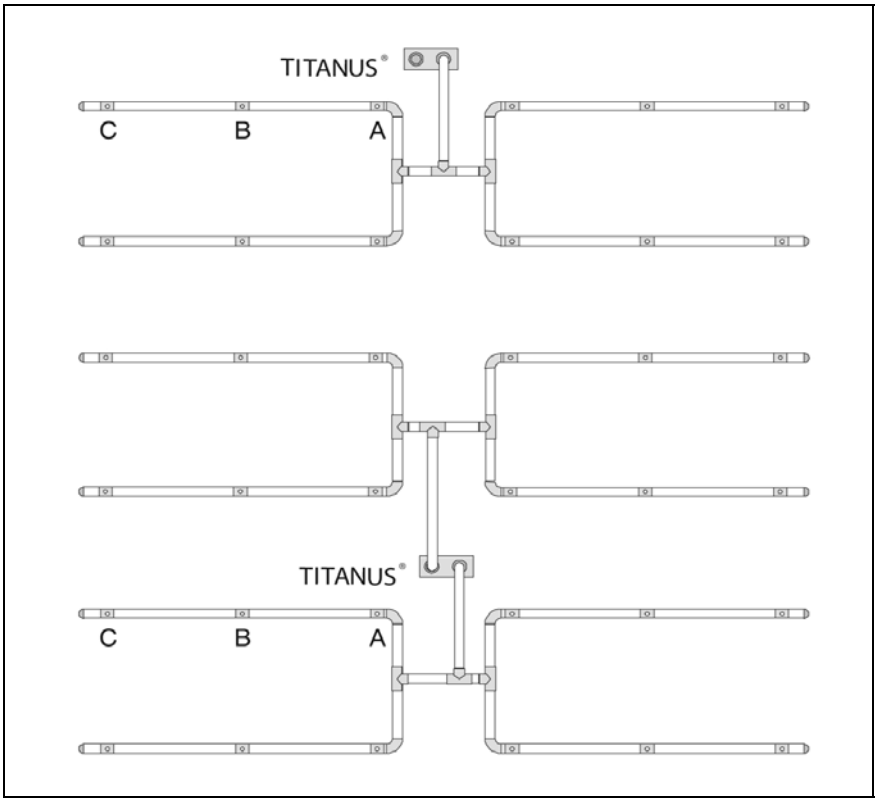


Fig. 4.17: Double-U-pipe system for space protection

Boundary values

Min. distance TITANUS® – last T piece	4 m
Max. distance TITANUS® – last T piece	20 m
Max. branch length - with small blower voltage - with larger blower voltage	 20 m 30 m
Max. total pipe length per pipe system - with small blower voltage - with larger blower voltage	 100 m 140 m
Min. distance between 2 suction openings	4 m
Max. distance between 2 suction openings	12 m
Max. number of suction openings (n) per pipe system	12

Suction openings

Number of openings per pipe system	**4**	**8**	**12**
∅ Suction opening in mm[16])			
A	4.0	3.0	2.5
B	—	3.4	3.0
C	—	—	3.0

Activation Thresholds Double-U-Pipe System per Pipe System

Activation thresholds

Number of openings	**4**	**8**	**12**
1 blocked opening	I	—	—[17]
2 blocked openings	II	I	—
3 blocked openings	O[18]	II	I
4 blocked openings	O	III	II
5 blocked openings	O	O	III
6 blocked openings	O	O	III
… will be recognized by the setting level x			

Example If the blockage of **4** suction openings **of a total of 12** suction openings should be recognized, then the switch for setting the airflow monitoring should be set to **level II**.

[16] Punch diameter of the suction-reducing film sheet
[17] — not possible
[18] O does not make sense

4.7 Planning for Forced Airflow

Monitoring of air-conditioning ducts

With air conditioning units, there is a distinction between low and high-speed units (see table below). The details provided in this chapter apply **only for low-speed units**. For high-speed units there are no sufficient experiential values. For air-conditioning ducts with flow speeds above 10 m/s, therefore, smoke trials must be executed in order to determine the optimal activation behavior.

	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 looks like this:

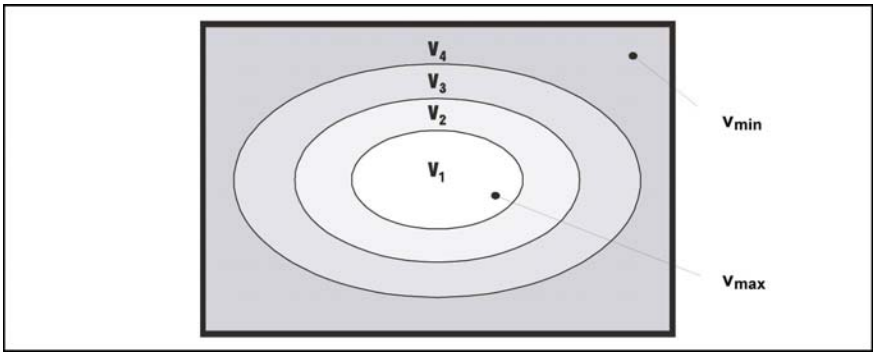


Fig. 4.18: Speed distribution in an air-conditioning duct with $v_1 > v_2 > v_3 > v_4$

In the external field of the cross sectional area the air flow is the smallest.
In the centre of the cross sectional area the air flow is the greatest.

Suction

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 such “hurdles” should be at least three times the smallest duct diameter.

If it is absolutely necessary to mount the pipe system directly behind air baffles, sound dampers or bends, the main speed areas must be monitored (see Fig. 4.19/4.20).

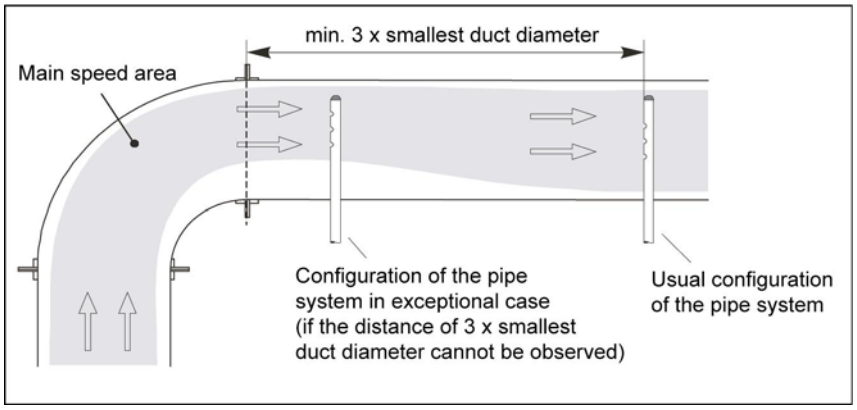


*Fig. 4.19: Direction change of the duct **without** air baffles*

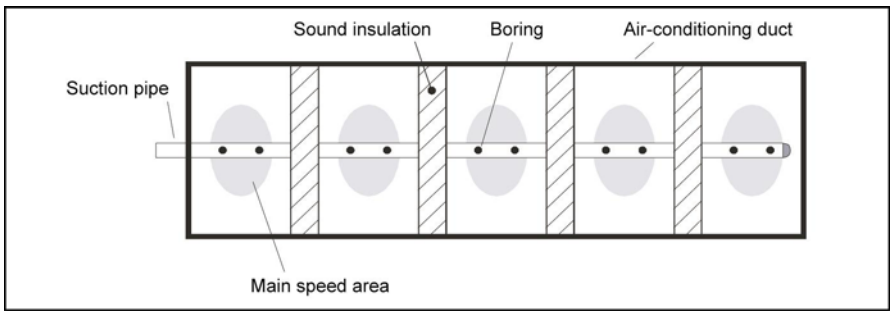


Fig. 4.20: Sound dampers in a duct

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

- since the TITANUS *TOP · SENS* ® and the pipe system are in different pressure areas, an air return (see next page) must be provided.
- the pipe entries in the duct must be airtight.
- the portion of the pipe system that is outside the duct must be glued airtight.

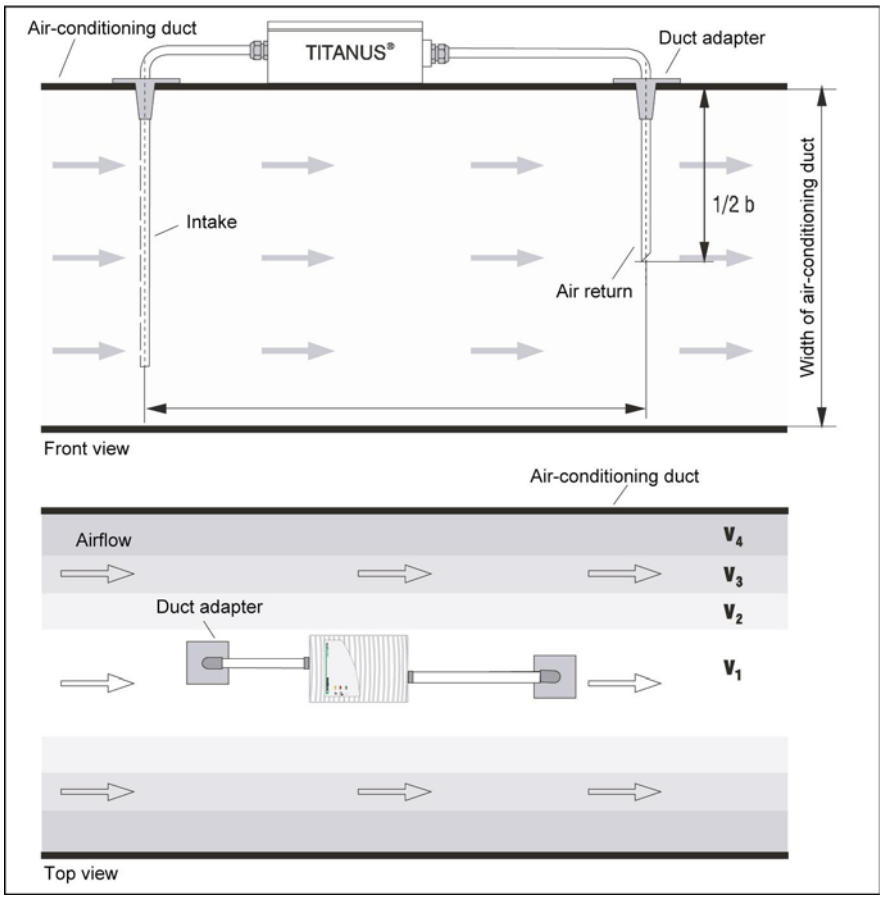


Fig. 4.21: Air return

Air return The air return must be placed at a distance of at least 2 m from the intake. The open end of the return is sloped at a 45° angle.

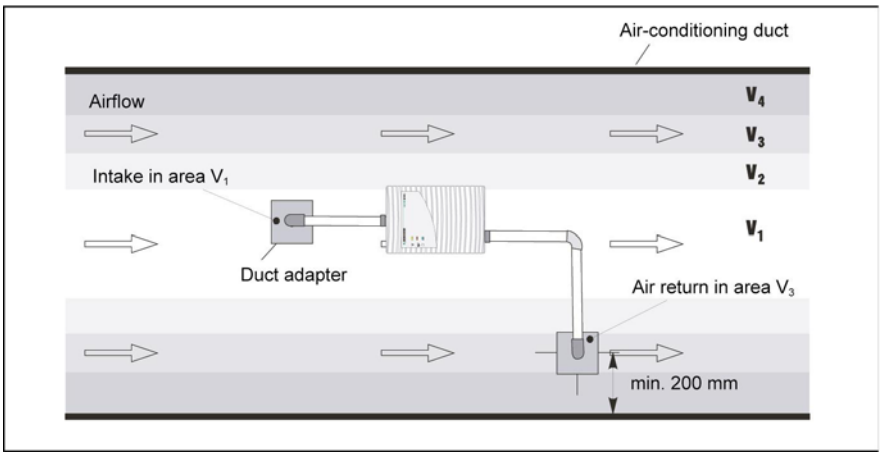


Fig. 4.22: Offset arrangement of the air return

If the distance of 2 m cannot be adhered to, the pipes must be arranged offset. This way, a pressure fall between intake and exhaust can be achieved since the pipes are in different speed areas (see Fig. 4.22).

Distance borings

The distance of the suction openings to one another and to the duct wall is represented in the following table.

	Duct cross-section ≤ 0.5 m²	**Duct cross-section > 0.5 m²**
Distance of the suction openings to the wall	100 to 200 mm	200 to 300 mm
Distance of the suction openings to one another	100 mm	150 mm

Diameter of the suction openings

The diameter of the suction openings arises from the number of suction openings. The precise value can be found in Chapter 4.6.4 “Simplified Pipe Planning.”

The pipe end is constructed with an end cap without boring.

Arrangement

The suction openings must be arranged counter to the airflow.

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

Example

The following figure depicts two planning examples for pipe systems in air-conditioning ducts.

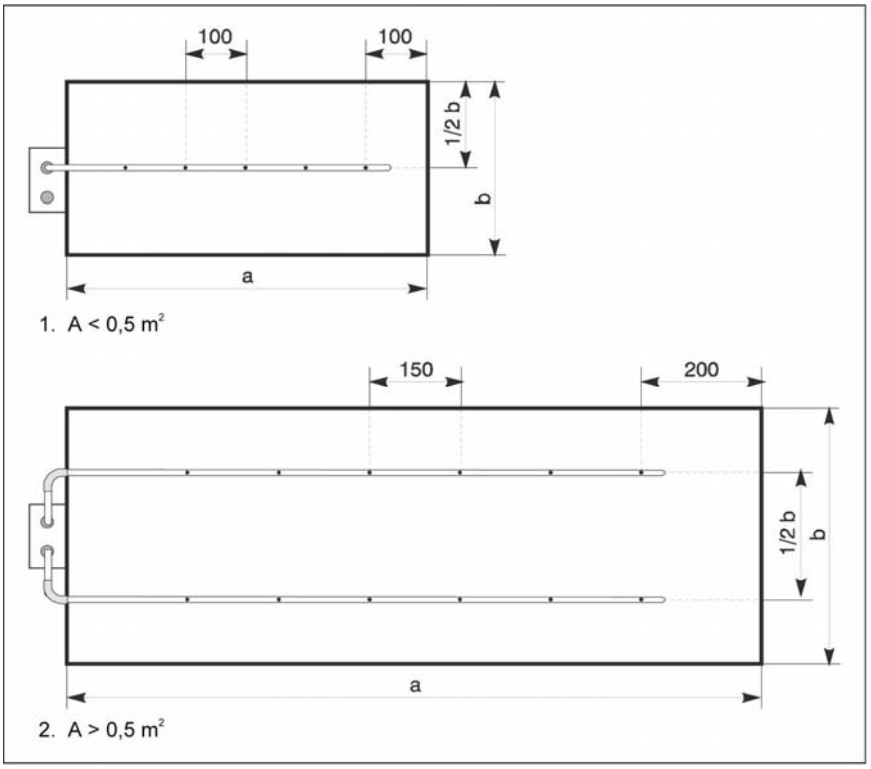


Fig. 4.23: Ducts with small (1.) and large (2.) duct cross-sections

4.8 Power Supply

To measure the power supply, the detector-ready state of the sec. sys and the alarm case are regarded. In the detector-ready state of the system, the power supply must deliver the stand-by power for the smoke extraction system and guarantee the charging of the emergency power rechargeable battery in accordance with DIN VDE 0833, part 1[19].

In case of alarm, the following formulas apply:

Power calculation

The power in case of alarm is calculated using the following formula:

Space protection

$$I_{ges,Raum} = I_{Alarm} \cdot n_{\max.Bereich} + I_{Ruhe}(n - n_{\max Bereich}) \leq I_{Netzteil,\max.}$$

Equipment protection

$$I_{ges,Einrichtung} = I_{Alarm} \cdot \sqrt{n} + I_{Ruhe}(n - \sqrt{n}) \leq I_{Netzteil,\max.}$$

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

Charging power

$$I_{Auflade} = \frac{0{,}8 \cdot K_{Nenn}}{24}$$

$$I_{ges,Raum/Einrichtung} = I_{Ruhe} \cdot n + I_{Auflade} \leq I_{Netzteil,\max.}$$

I_{ges} = Total power of all connected smoke extraction systems in [A]

$I_{Netzteil,\ max.}$ = Max. power supply of the network power supply in [A]

n = Total of all smoke extraction systems connected to a power supply

$n_{max\ area}$ = Total number of all smoke extraction systems in the area with the largest energy requirement

I_{Alarm} = Alarm power of a smoke extraction system in [A]

I_{Ruhe} = Stand-by power of a smoke extraction system in [A]

K_{Nenn} = Rated capacity of the rechargeable battery in [Ah]

$I_{Auflade}$ = Charging power of the rechargeable battery (within 24 hours 80% of the nominal capacity) in [A]

NOTE

The calculated total power (*I ges*) with the largest value is used to lay out the mains!

For the current consumption of the TITANUS *TOP · SENS*®, please see Chapter 3 “Technical Data.“

[19] 80% charging in 24 hours

Line calculation

The maximum line length arises from the permissible voltage drop on the supply line. The permissible voltage drop is the difference between the final discharging voltage of the emergency power rechargeable battery (21.5 V) and the lower operating voltage limits of the smoke extraction systems.

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

L_{max} = maximum line length in [m]
A = strand cross-section in [mm²]
I_{ges} = Total power of all connected smoke extraction systems in [A]
γ = capability: Cu=57m/Ωmm²
ΔU = max. voltage drop on the supply line

To guarantee the impermeability of the housing, the corresponding grommet must be selected for the existing cable.

- M 25 grommet: ∅9 to 14 mm
- M 20 grommet: ∅8 to 12 mm

Emergency power calculation The rated capacity is calculated according to the following formula:

$$K_{Nenn} = (I_{Ruhe} \cdot n \cdot t + I_{ges} \cdot 0{,}5h) \cdot 1{,}25$$

K_{Nenn} = Rated capacity of the rechargeable battery in [Ah]
t = Required bridging time in [h]

The factor 1.25 used in the equation is only applicable with bridging times less than or equal to 24 hours.

TIP

To simplify the voltage calculation, the program UezPro (planning help for fire detection systems) can be used.

5 Installation TITANUS *TOP · SENS*®

5.1 General Remarks

The regulations, guidelines, and provisions described in Chapter 4.1 apply.

When installing the TITANUS *TOP · SENS*® smoke extraction system, the following things must be taken into account:

1. Changes to and rebuilding of equipment should be avoided. If adjustments cannot be avoided, then they must be discussed with the operator, the device manufacturer and/or the delivery company (written permission).
2. All changes to the house mains (230 V/400 V supply) and to third-party systems must be executed by the builder. To this belong, e.g.:
   - the primary connection of the net battery charger,
   - the execution of possibly-necessary norm-conforming lightning and overvoltage protection measures.

WARNING

All connection work must be carried out only when the device is voltage-free!

5.2 Opening the TITANUS *TOP · SENS*® Smoke Extraction System

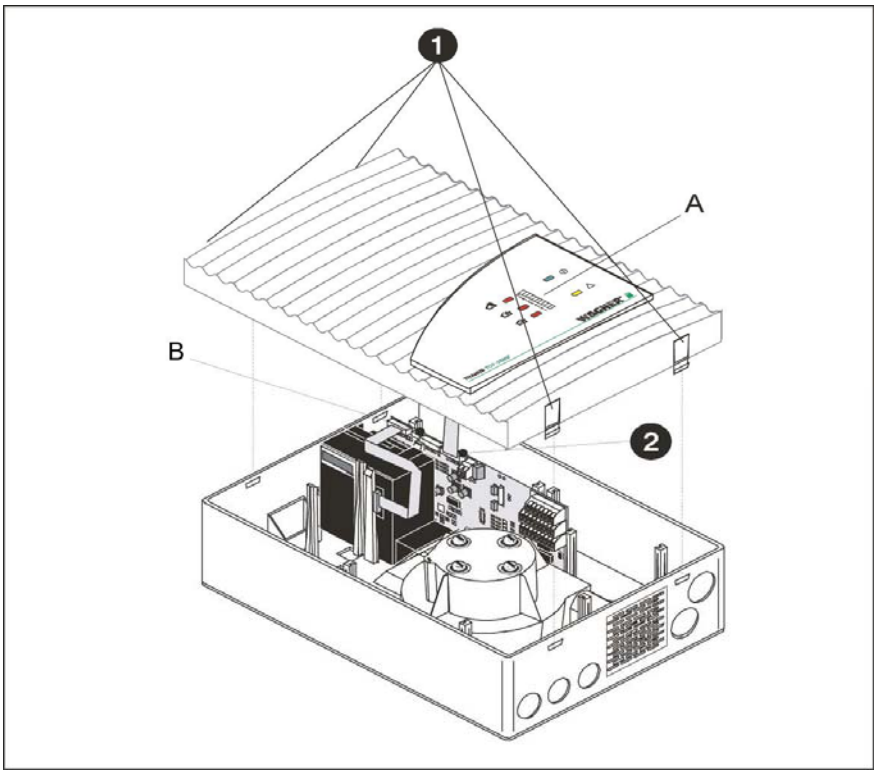


Fig. 5.1: Opening the TITANUS *TOP · SENS® smoke extraction system*

A Display board (at the back)
B Motherboard

WARNING

The components on the motherboard must be protected against damage due to static discharge.

To open the TITANUS *TOP · SENS*®, proceed as follows (see **Fig. 5.1:**):

1. Unlock the quick-release fasteners: with the help of a pan head slotted-screwdriver, press two of the fastener latches on the upper and lower sides of the housing simultaneously. Then lift the housing cover off carefully.
2. Unplug the display board cable from the motherboard. Now you can remove the housing cover.

5.3 Setting the Detector Module

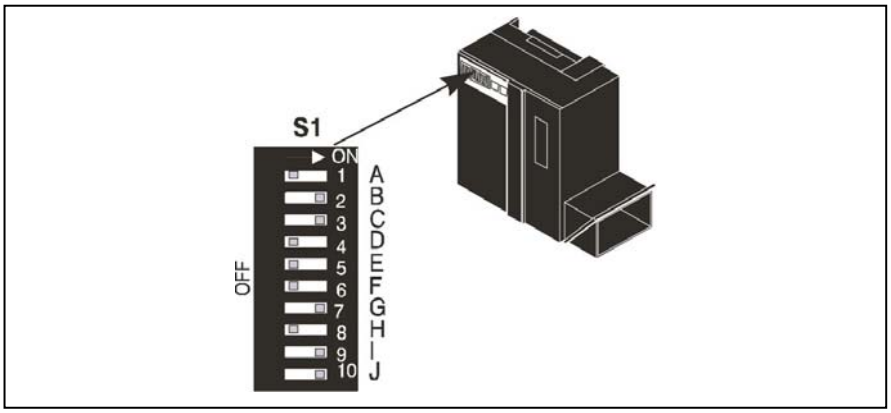


Fig. 5.2: Standard settings on the TITANUS *TOP · SENS® detector module*

5.3.1 Response Sensitivity

The sensitivity of the detector module is set using the switches S1, contacts 1 and 2 on the detector module (see **Fig. 5.2**).

The following table shows the response sensitivity of the three detector module variants of the TITANUS *TOP ·SENS®* with the corresponding switch settings (contacts 1 and 2):

Detector module DM-TT-05	Detector module DM-TT-25	Detector module DM-TT-80	Switch S1 Contact 1	Switch S1 Contact 2
0.4 %/m	2 %/m	not possible	on	on
0.2 %/m (default)	1 %/m (default)	not possible	off	on
0.1 %/m	0.5%/m	1.6 %/m (default)	on	off
0.05 %/m	0.25 %/m	0.8%/m	off	off

5.3.2 Delay Time of the Alarm Activation

The delay time for the alarm thresholds can be set using the switch S1 (contacts 3 and 4). By default, the delay time for the alarm is set to 10 seconds. If the smoke level increases during operation until it reaches the alarm threshold, the delay time begins to pass. Only after expiration of the delay time with a continued alarm is the message transmitted. Thus false alarms due to brief strains (e.g. dust) can be prevented.

Alarm delay time	Switch S1 Contact 3	Switch S1 Contact 4
0 sec	off	off
10 sec (default)	on	off
30 sec	off	on
60 sec	on	on

TIP

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

5.3.3 Activation Threshold of the Airflow Monitoring

Set the activation threshold of the airflow monitoring using switch S1 (contacts 5 and 6) on the detector module (see **Fig. 5.2**) of the TITANUS *TOP · SENS*®.

Level	Activation threshold	Switch S1 Contact 5	Switch S1 Contact 6
I	small	on	off
II	medium	off	on
III	large (default)	off	off
IV	very large	on	on

Select the activation threshold according to Chapter 4, “Planning.”

5.3.4 Delay Time of the Airflow Malfunction

The delay time for the transmission of the malfunction message is set using the contacts 7 and 8 of switch S1 on the detector module (see Fig. 5.2).

Set the delay time	Switch S1 Contact 7	Switch S1 Contact 8
0.5 min	off	on
2 min (default)	on	off
15 min	on	on
60 min	off	off

By default, a delay time of 2 min is set. In areas with temporally-restricted disturbance variables (e.g. air pressure fluctuations), other delay times -- according to the duration of the disturbance variables – should be set.

5.3.5 Malfunction Display

Using the switch S1 contact 9 (see Fig. 5.2) the display for the collective malfunction (airflow and detector module malfunction) can be set optionally to save (default) or not save.

Malfunction message	Switch S1 Contact 9
saving (default)	on
not saving	off

WARNING

If an LSN is connected, the malfunction display must be set to “not save.”

5.3.6 LOGIC · SENS

The intelligent signal processing ***LOGIC · SENS*** is activated or deactivated with the switch S1 contact 10. With switched-on signal evaluation, the smoke extraction system recognizes disturbance variables and can thus prevent a false alarm.

LOGIC · SENS	Switch S1 Contact 10
on (default)	on
off	off

TIP

For test purposes, the ***LOGIC · SENS*** intelligent signal processing must be switched off.

5.4 Setting the TITANUS *TOP · SENS*®

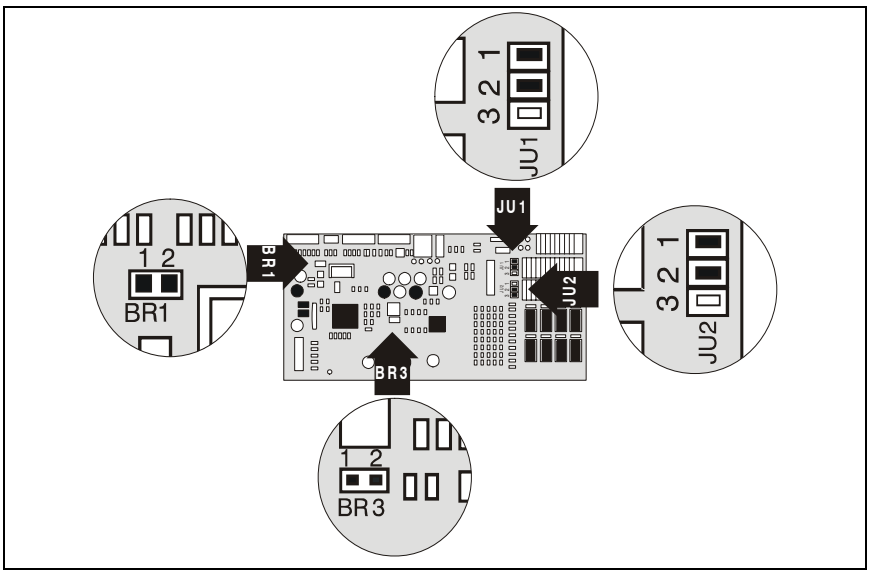


Fig. 5.3: Jumper settings on the circuit board

5.4.1 Blower Voltage

The standard setting of the blower voltage is 6.9 V. In critical areas, the blower voltage can be switched by switching the jumper BR3 from 6.9 V to 9 V in order to increase the transport speed in the pipe system and thus guarantee quicker detection with longer pipe lengths.

Jumper Pin no.	BR3 1+2
6.9 V	X
9 V	O

X = pin pair bridged
O = pin pair open

WARNING

Re-execute the airflow initialization if you switch the blower voltage. Close or open the jumper BR3 only when the device is switched off.

5.4.2 Number of Detector Modules

The number of detector modules is chosen ex factory via the BR1 jumper on the circuit board (see Fig. 5.3).

Jumper: Pin no.:	**BR1 1+2**
TITANUS *TOP·SENS*® TT-1: 1 detector module	X
TITANUS *TOP·SENS*® TT-2: 2 detector modules	O

X = pin pair bridged
O = pin pair open

5.4.3 Collective Fault Contact

The contact type (cut off or close contact) of the collective fault is set using the JU1 and JU2 jumpers (see Fig. 5.3).
The standard setting ex factory is highlighted in grey.

Jumper: Pin no.:	**JU1 1+2**	**JU1 2+3**	**JU2 1+2**	**JU2 2+3**
cut off contact	X	O	X	O
close contact	O	X	O	X

X = pin pair bridged
O = pin pair open

5.5 Installation Location

5.5.1 Mounting of the TITANUS *TOP · SENS*® Smoke Extraction System

The TITANUS *TOP · SENS* smoke extraction system can either be screwed directly to the wall with the rear panel or installed with the assistance of a special bracket (see Chapter 2.2.5 "Device Brackets").

NOTE

The installation location may not be in a place where doors are opened. The installation location must be selected so that the displays are readily visible.

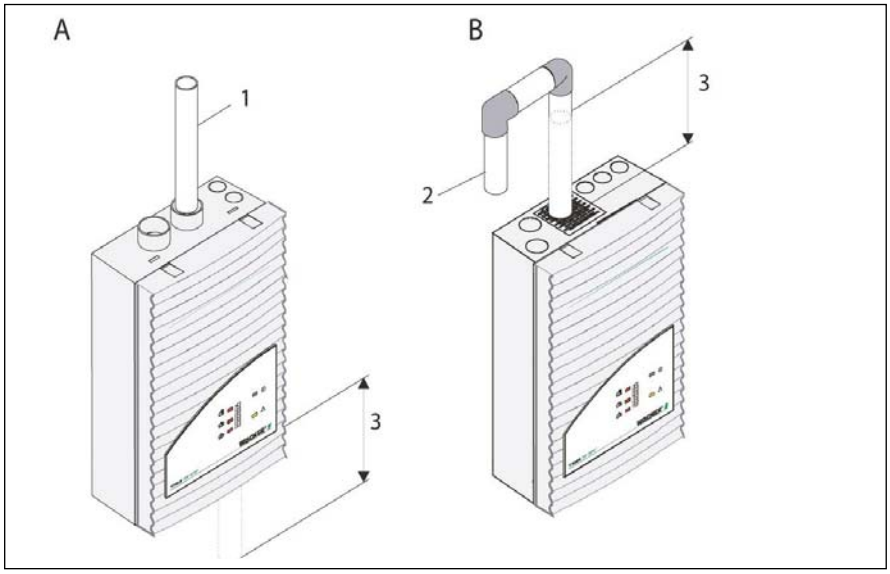


Fig. 5.4: Installation of TITANUS TOP · SENS® (A: Device top side, B: Devive bottom)
1: Suction pipe
2: Air return
3: Min. 10 cm distance to surrounding components

Between the TITANUS *TOP · SENS*® air outlet and surrounding components (e.g. wall), there must be a distance of **at least 10 cm** so that the air outlet is not hindered.

The device can be installed with the suction apparatus upwards or downwards. Turn the cover accordingly by 180°.

Suction downwards

If the TITANUS *TOP · SENS*® is installed with the suction apparatus downwards, make sure that neither foreign bodies nor dripping water can penetrate the air outlet opening that is pointing upwards. For this, use a short pipe that is angled downwards.

Installation material

TITANUS *TOP · SENS*®	Cylindrical or flat-top screw -- thread diameter: max. 6 mm – head diameter: 10 mm
Bracket (type MT-1)	Cylindrical or flat-top screw -- thread diameter: max. 4 mm – head diameter: 5 to 7 mm

Boring distances The distances between the holes bored are depicted in the following figures (all measurements in mm).

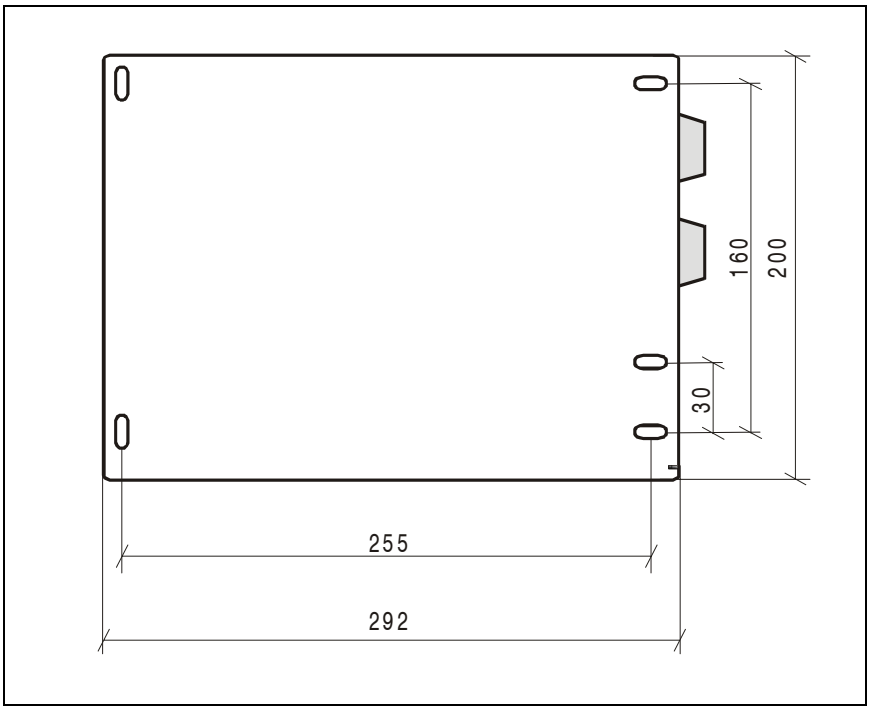


*Fig. 5.5: Boring distances TITANUS® **without** bracket*

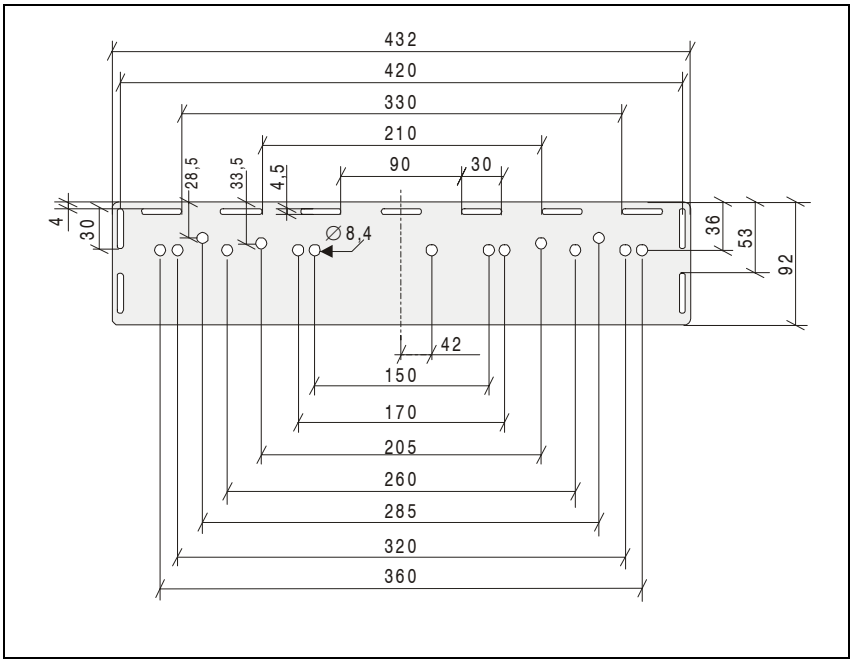


Fig. 5.6: Boring distances with the bracket type MT-1

5.5.2 Connecting the Suction Pipe

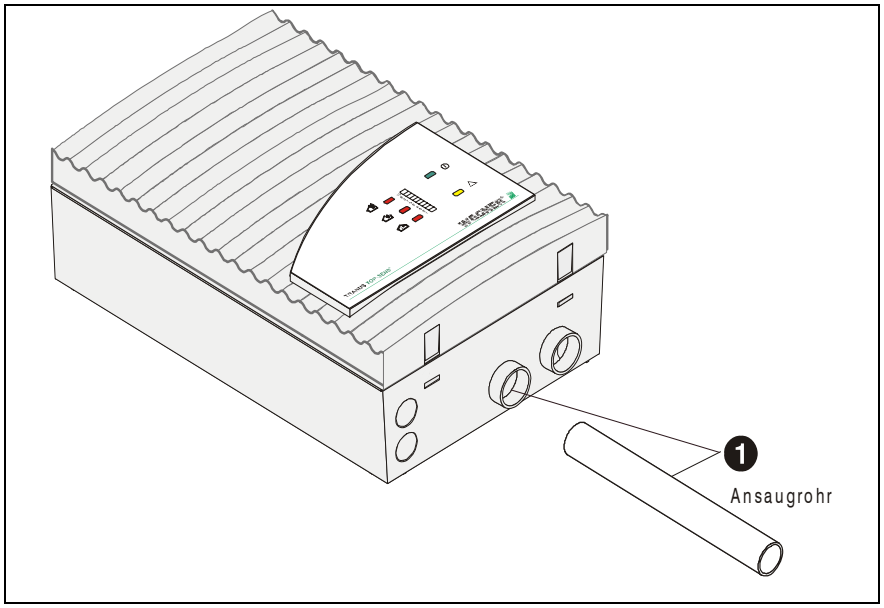


Fig. 5.7: Connecting the suction pipe to the TITANUS TOP · SENS® smoke extraction system

Connection suction pipe

1 To connect the suction pipe with the TITANUS *TOP · SENS*®, plug it into the pipe connection provided for this (see Fig. 5.7).

NOTE

Do not use glue to connect the suction pipe and pipe connection.
In case of sharp temperature fluctuations, the pipe must be fixed immediately in front of the device so that the pipe does not pull out of the pipe connection due to the changes in length that may occur (see Chapter 6.1).

5.6 Connection to the Fire Panel

WARNING

Execute all connection work only when the device is voltage-free!

To prepare the electrical connections, first execute the following steps:

1. Punch out the number of cable entry points needed, e.g. with a screwdriver.
2. Place the plastic connection pieces M20 or M25 in the appropriate cable entry points.
3. Feed the cable through the appropriate cable entry points.

NOTE

One M20 and **two** M25 plastic connection pieces are included with the device.

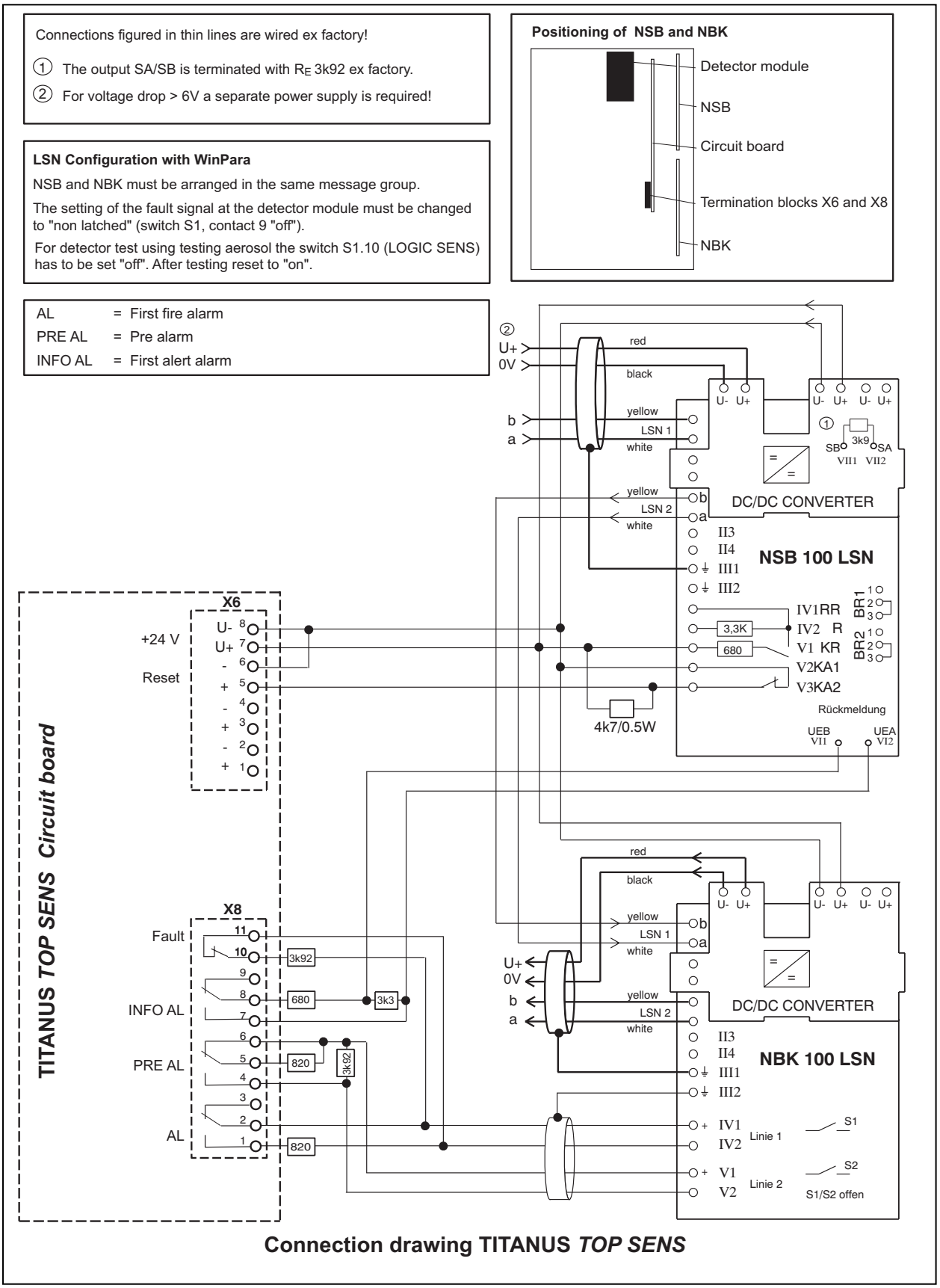
The electrical connection occurs via the integrated fire control interface and fire interface couplers. These are cabled with the motherboard of the TITANUS *TOP · SENS*® *(*terminal strips X6 and X7, with TITANUS *TOP · SENS*® TT-2 additionally X9) at the factory.

NOTE

If the TITANUS *PRO·SENS*® TP-2 A is connected to the Modular Fire Panel FPA-5000, the power supply of the TITANUS devices takes place via AUX 1-3 of the Battery Controller Module BCM 0000.

NOTE

To maximize the security against malfunction, use shielded cable for the external cabling of the devices.



Connection drawing TITANUS *TOP SENS*

Fig. 5.8: Connecting TITANUS TOP · SENS® TT-1to a fire panel

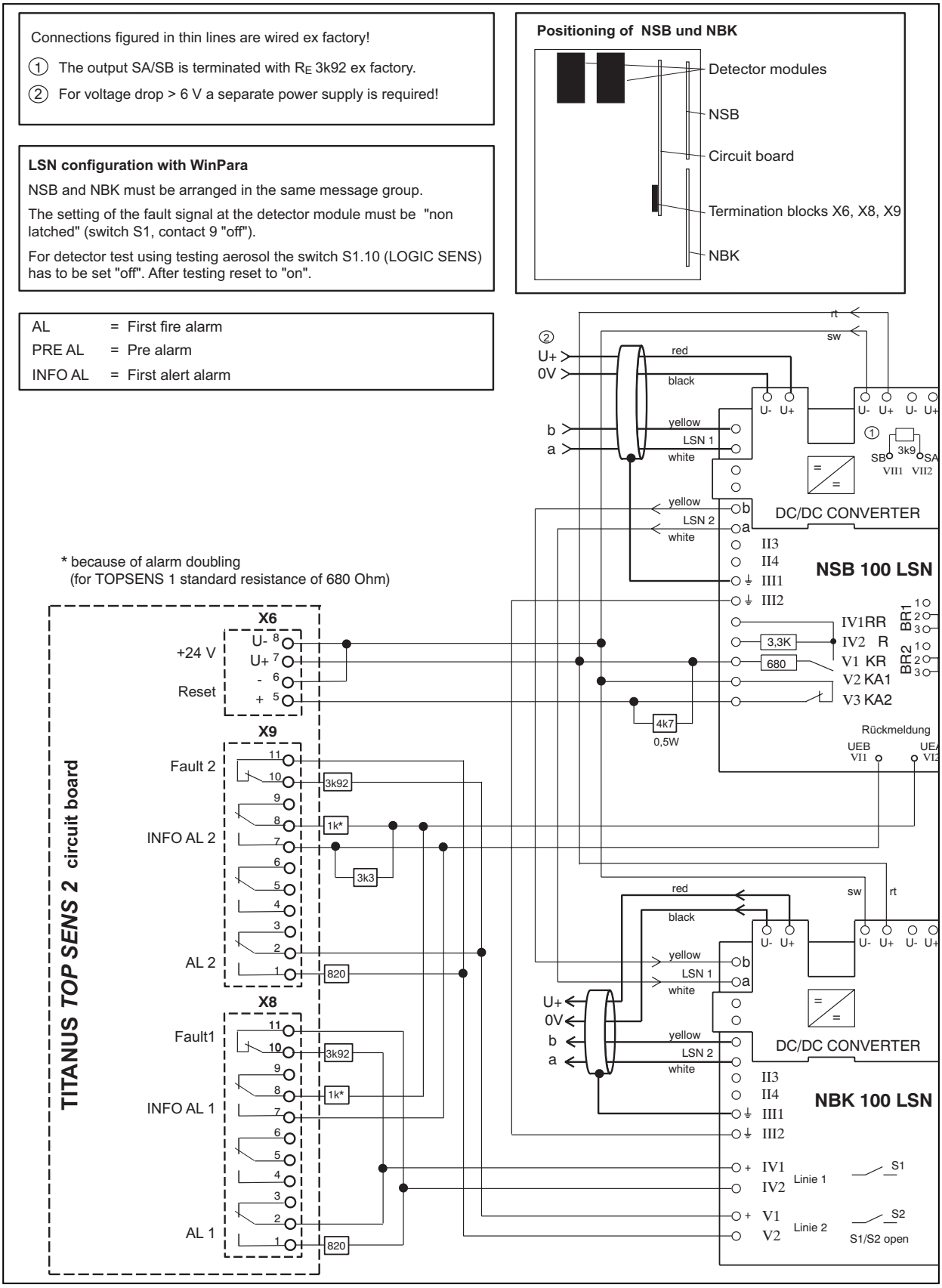


Fig. 5.9: Connecting TITANUS TOP · SENS® TT-2 to a fire panel

5.6.1 LSN Configuration with WinPara

After connecting the TITANUS *TOP · SENS*® to the LSN, the control interface NSB and fire interface NBK are created in the WinPara program.

Select the following setting for the control interface NSB:

1. Control output NSB100 KA1-KA2/KR-R-RR
2. Control options: “control with RAS/Fireray/ADW…”

NOTE

The control interface and fire interface must be created in the same detector group (e.g. as 127/1 and 127/2).

WARNING

The malfunction display on the TITANUS *TOP · SENS*® must be set to "not saving“ (see section 5.3.1.5).

In case of the TITANUS *TOP·SENS*® TT-2, a two-detector dependency can be realized. A two-zone dependency (cross-zoning) is not possible with WinPara.

5.6.2 LSN Configuration with RPS (Remote Programming Software)

After connecting the TITANUS TOP·SENS® TT-1 / TT-2 to the Modular Fire Panel FPA-5000, the interfaces NSB 100 LSN and NBK 100 LSN have to be configurated with the RPS program.

Choose the following settings:

<u>For the NSB 100 LSN:</u>

1. Relay "1-KA1-KA2/KR-R-RR" use as "RAS/Fireray/ADW53/LHD4".
2. Choose standby mode "on".

<u>For the NBK 100 LSN:</u>

1. For „1-monitored line“ in the window „reset action“, pick the output "1-KA1-KA2/KR-R-RR" of the relay NSB 100 by a reset time of 5 s.
2. Choose alarm detection by “current”.

NOTE

If the TITANUS *PRO·SENS*® TT-2 is connected to the Modular Fire Panel FPA-5000, a two-detector dependency as well as a two-zone dependency can be realized.

5.7 Exchanging the Detector Module

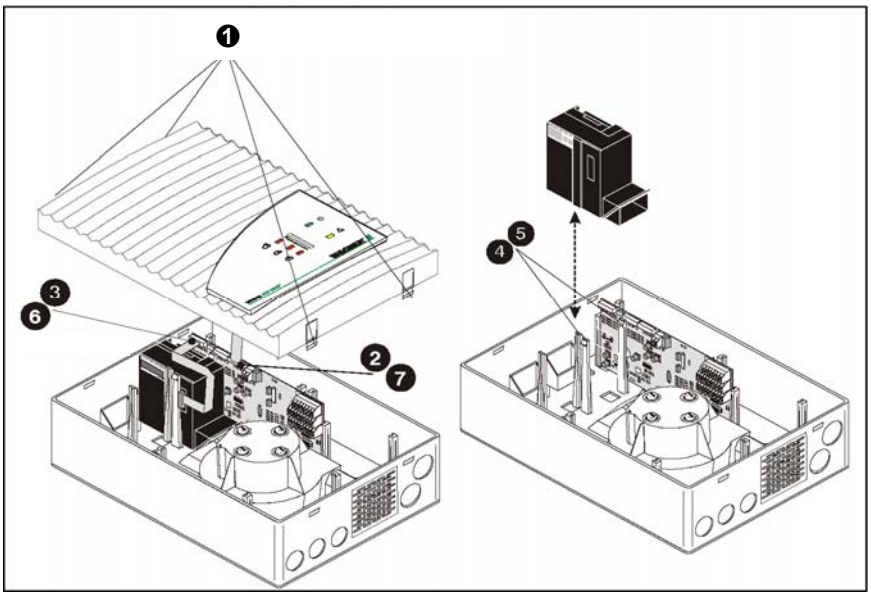


Fig. 5.10: Exchanging the detector module

WARNING

Execute all connection work when the device is voltage-free!

❶ Unlock the quick-release fasteners: with the help of a pan head slotted screwdriver, press simultaneously on the four closure latches of the housing. Lift the housing cover carefully and unplug the cable from the display board. Now you can remove the housing cover.

❷ Unplug the detector module's connector cable from the motherboard.

❸ Spread both detector module brackets carefully and remove the module.

❹ Spread both the brackets again and place the new detector module in. Both brackets must lay against the detector module and snap in audibly. Then press both brackets together again.

❺ Connect the detector module with the motherboard again using the flat-band cable. Connection: X1 (HEAD1)

Plug the display board into the motherboard X4 (DISPLAY).

Before initialization, the operating voltage must be connected again. For initialization of the pipe system, press the flow-init button S2 on the detector module.

Close the housing cover.

NOTE

Calibration of the detector module is not necessary.

5.8 Vibration Absorbers

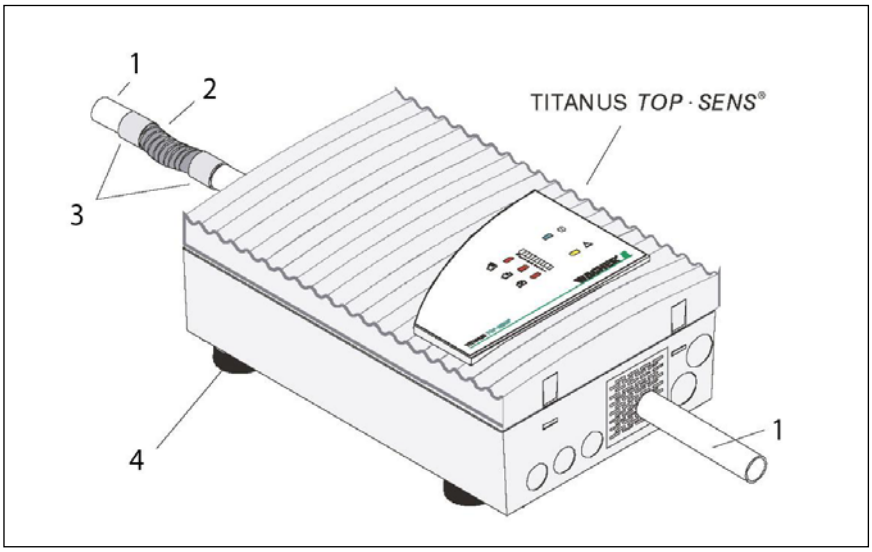


Fig. 5.12: Absorption of the operating noises caused by airflows

1 Pipe
2 Corrugated hose
3 Fitting
4 Vibration absorber

To reduce the sound power level by **1 to 2 dB(A)**, install the TITANUS *TOP · SENS*® on vibration absorbers (e.g. when mounting on lightweight construction walls).

Additional operating noises can arise due to vibrations on the pipe system that are caused by the air flowing through it. To avoid these, create a flexible transition with the help of a corrugated hose (approximately 15 cm).

NOTE

In noise-sensitive areas, the noise level can also be reduced by installing a piece of plastic pipe approximately 100 mm long in the air outlet opening of the device. For this, break out the pre-punched opening in the protective grille (e.g. using a small edge cutter).

5.9 Data Logging

The *DIAG* diagnostic software handles the execution of device tests.

With a laptop directly on location, it is possible to read out the current airflow sensor data, smoke level values, and various status values. The recognition of changed operating conditions is thus simplified considerably in case of service.

The reading-out of the data occurs via the PC's COM port (COM1 or COM2) after starting the software. For details, please see the diagnostic software documentation. See also Chapter 7.5.2 "Execution of the Functional Test" using diagnostic software.

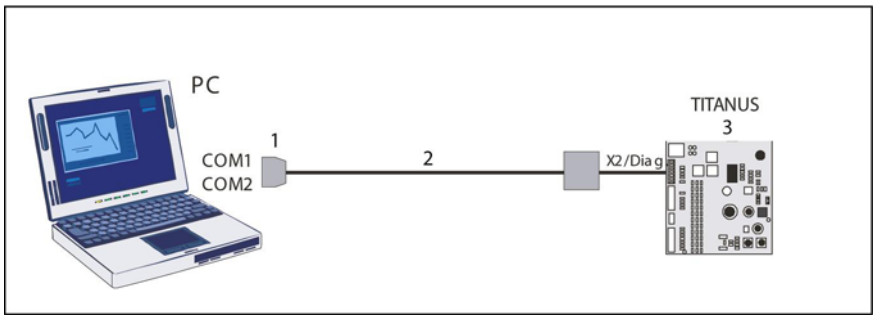


Fig. 5.15: Connecting a PC via the diagnostic cable

1 Sub-D-plug
2 Diagnostic cable
3 Motherboard

6 Installation of the Pipe System

Installation Instructions

The pipe system must be constructed according to planning specifications and taking into account the planning guidelines (see Chapter 4 “Planning”).

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 cleanser (Tangit) to make sure there is no dirt or grease present. Use the Tangit adhesive to glue the pipe transitions with the appropriate fittings so that they are airtight.


NOTE

If halogen-free plastics must be used, then depending on the material selected, the installation procedures may vary:
ABS is glued, polypropylene (PP) welded, and polyamid (PA) stuck together and screwed.

3. Minimize pipe lengths and changes of direction. Angles have an extremely high flow resistance. Therefore, use these only where they are unavoidable for building-technical reasons. If necessary, reduce pipe lengths in proportion to the angles used [1].


NOTE

Bends must absolutely be preferred to angles. Too high a number of changes of direction can cause an airflow malfunction in the TITANUS T*OP · SENS*® and have a negative impact on the detection time.

4. Lay the pipe fast, it must not sag nor 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.


NOTE

Do not use pipe clips with rubber inserts since these allow no length extensions and the pipe system could thus bend or even tear.

5. Close open pipe ends with an end cap.


NOTE

After completion, test the pipe system:
- for leakages (e.g. due to damage)
- for flawed connections
- for correct planning of the suction openings

[1] As a benchmark, a bend corresponds to a straight pipe length of 0.3 m.
An angle corresponds to a straight pipe length of 1.5 m.

6.1 Length Change of the Pipe System

Length changes to 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 taken into account even more if the temperature of the pipe system at the time of installation deviates from the normal operating temperature.

The length change can be calculated with the following formula:

$$\Delta L = L \times \Delta T \times \delta$$

ΔL = length change in (mm)
L = length of the pipe to be calculated in (m)
ΔT = maximum temperature difference in (°C)
δ = length change coefficient in mm/m°C
δ_{PVC} = 0,08 mm/m°C
δ_{ABS} = 0,101 mm/m°C

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

Fastening clamps By default, PVC pipe clips are used for installation of the pipe system. These clips allow length extensions.

6.2 Patented Suction Openings

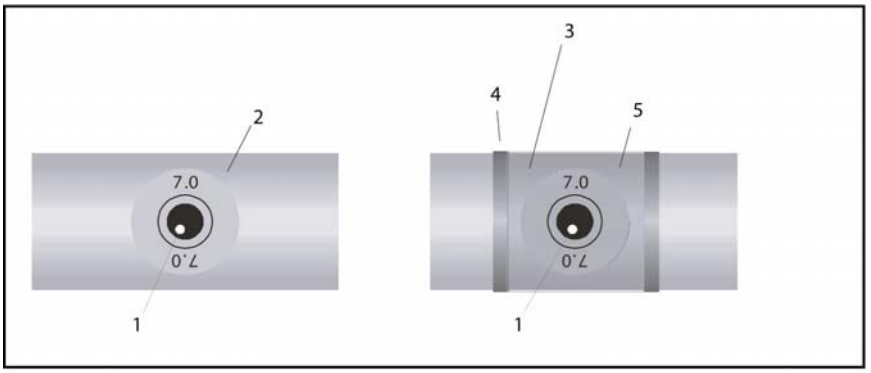


Fig. 6.1: Example of a suction boring with suction-reducing film sheet

1 Suction opening
2 Suction reducing film sheet
3 Marking tape
4 Color: fire red, RAL 3000
5 Color: transparent

Suction openings Select the construction of the suction opening (suction boring) and the position in the pipe system according to the specification of the project and taking into account the planning guidelines.

Suction borings

1. Bore a suction bore with a 10 mm drill at a right angle to the pipe.
2. Deburr the boring carefully and remove chips.
3. Clean the boring area (across the entire span of the pipe) of grease and dust, e.g. with Tangit cleanser.
4. Select the size of the suction-reducing film sheet according to the specifications.
5. Glue the suction-reducing film sheet on the boring (see Fig. 6.2).
6. Secure the film sheet against loosening by gluing the marking tape over the suction-reducing film sheet.

NOTE

The holes of the suction-reducing film sheet and the marking tape must be exactly over the suction boring so that the opening diameter of the suction-reducing film sheet is not changed.
To keep the adhesive surfaces of the film sheet dust and grease-free, avoid touching them.

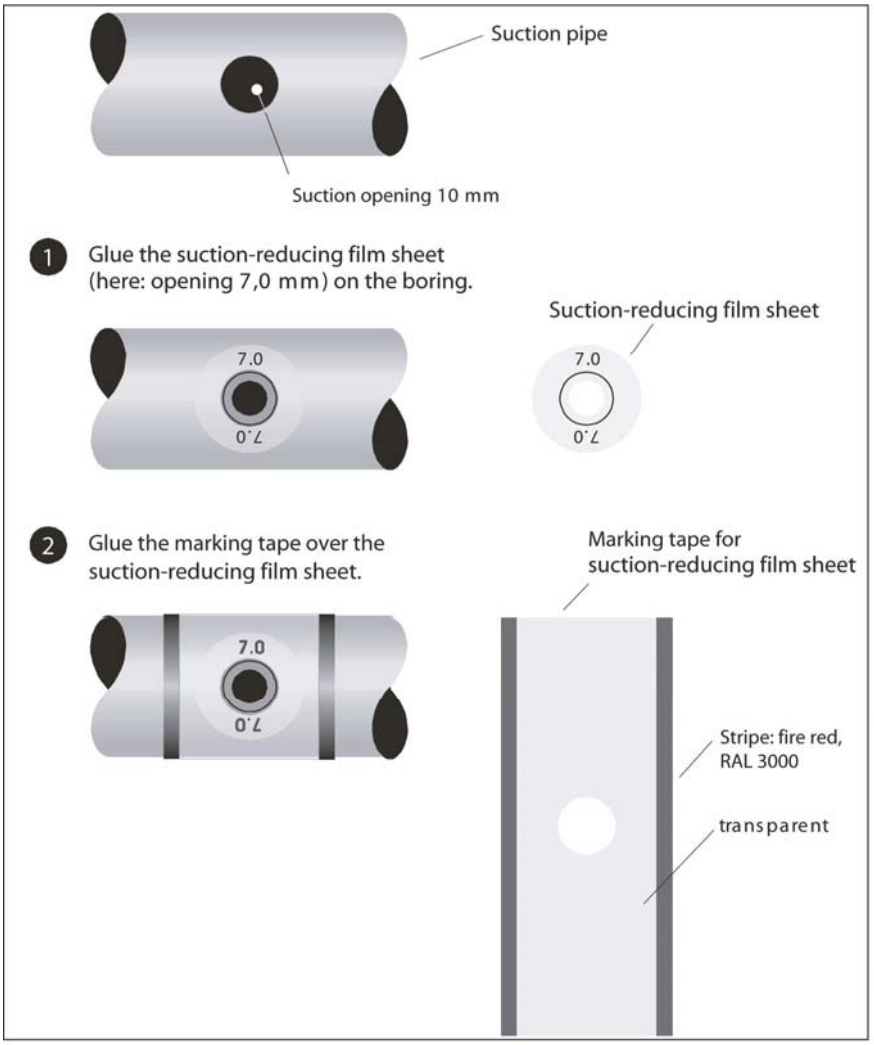


Fig. 6.2: Applying the suction-reducing film sheet

6.3 Monitoring with Forced Airflow

6.3.1 Detection at Intake and Exhaust Openings

NOTE

If the smoke extraction occurs in a forced airflow (blower, air-conditioning unit), direct the suction openings depending on the exhaust speed in the airflow (see Fig. 6.3).

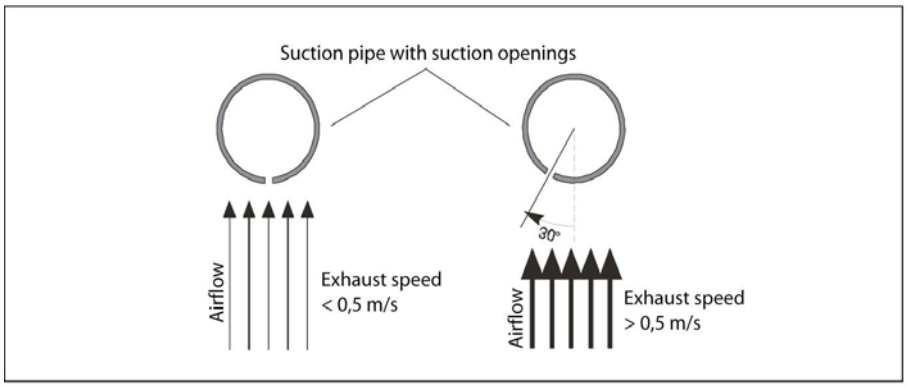


Fig. 6.3: Positioning the suction opening depending on airspeed

6.3.2 Detection in the Bypass

NOTE

For detection in airflows ≥ 2 m/s also feed the exhaust of the TITANUS *TOP · SENS*® back into the airflow area. Cut the end of the air-return pipe at an angle of 45° (see Fig. 6.5).

For the connection of the air return please see Chapter 6.5 “Air Return.“

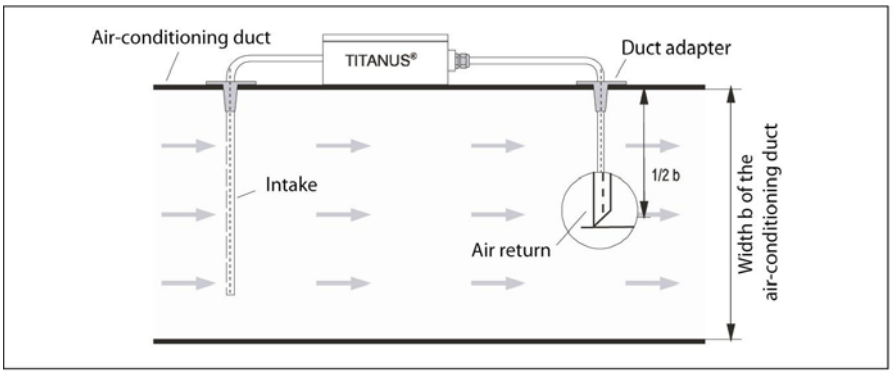


Fig. 6.4: Positioning the air return – example of an air-conditioning duct (bypass)

For planning of the TITANUS T*OP · SENS*® in these areas, see Chapter 4.7 “Planning for Forced Airflow.“

6.4 Air Filter

6.4.1 Installation of Filter Box

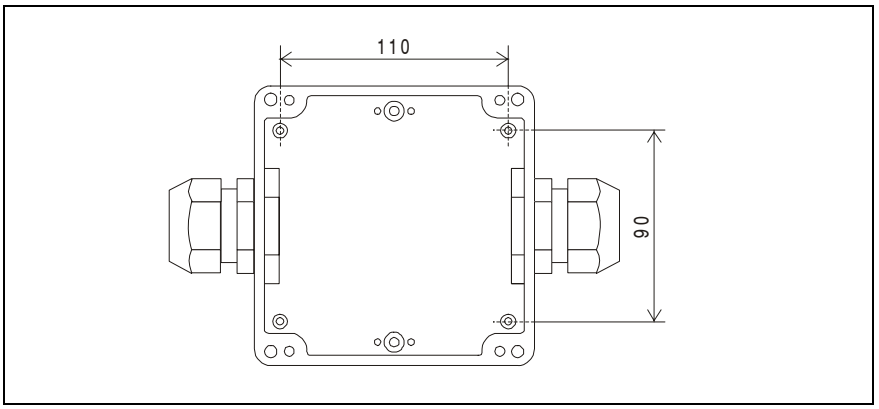


Fig. 6.5: Bore distances of the holes in the bottom of the filter box (large)

Filter boxes

1. To use the filter box in the pipe system, use the two included PG29 screw connections of the filter.
2. Install these screw connections precisely as for the pipe adapter.
3. When installing the filter, note the throughflow direction, which is specified on the label on the side of the lower portion of the housing.
4. Screw the air filter housing directly onto the wall with the lower portion of the housing.

Air filter (large)	**Installation Material**	Cylindrical or flat-top screw -- thread diameter: max. 4 mm – head diameter: 5 to 7 mm
	Dimensions H x W x D	120 x 122 x 85 mm
	Replacement filter mats (large)	Set: fine, medium, and coarse
Air filter (small)	**Dimensions H x W x D**	80 x 82 x 85 mm
	Replacement filter mats (small)	Set: fine, medium, and coarse

6.4.2 Changing the Filter in the Filter Box

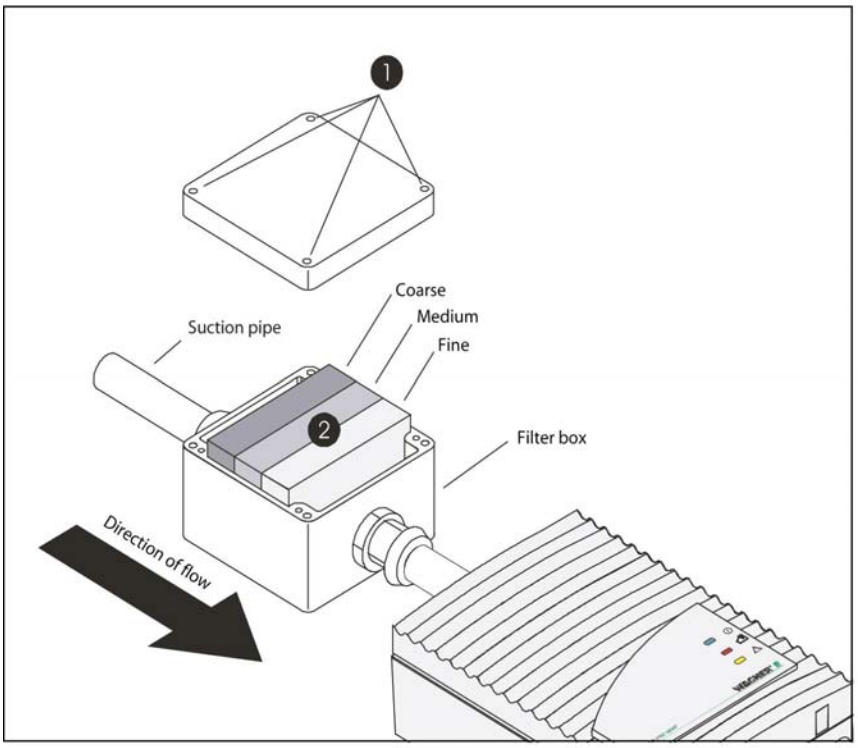


Fig. 6.6: Changing the filter inserts

To replace the filter inserts, execute the following steps (see Fig. 6.6):

❶ Loosen the four screws and remove the housing cover of the filter box.

❷ Remove the old filter inserts and clean the inside of the housing carefully to remove dust

Now insert the cleaned or new filter inserts in the correct sequence. For the correct sequence, see the note sticker on the bottom of the housing.

Replace the housing cover and screw it back on.

In applications with largely-fine dust build-up, three fine dust filters can also be used.

6.5 Air Return

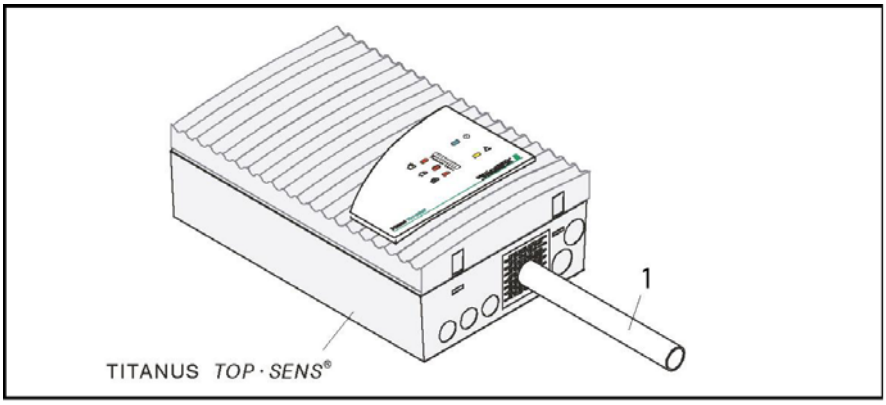


Fig. 6.7: Installation of the air return (1)

Fix the air return within the air exhaust opening. No additional components are required for this.

NOTE

In case of sharp temperature fluctuations, the air return must be fixed immediately in front of the device so that the pipe does not pull out of the pipe connection due to the changes in length that may occur (see Chapter 6.1).

Steps:

1. Remove the pre-punched pipe opening in the protective grille of the air exhaust opening (e.g. using a small edge cutter).
2. Insert the air return through the opened pipe opening in the enclosure and fix it to the TITANUS *TOP · SENS*® with the rubber ring already integrated into the air-exhaust opening.

6.6 3-Way Ball Valve

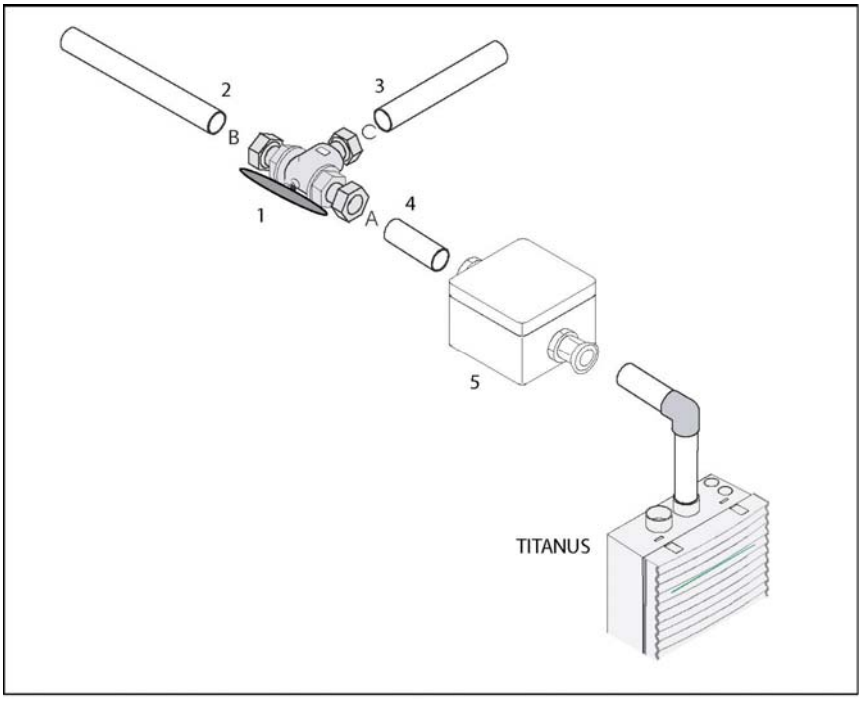


Fig. 6.8: Installation of the 3-way ball valve

1 3-Way ball valve
2 Connection compressed air supply (B)
3 Connection pipe system (C)
4 Connection TITANUS (A)
5 Air filter

The ball valve is required for blowing out with compressed air[2] . Fasten it into the pipe system with the help of the transition screw fittings.

For blowing-out, the connection to the TITANUS *TOP · SENS*® must be locked!

Connections When installing, note the occupation of the connections:

- Install the smoke extraction system on connection C.
- Install the TITANUS *TOP · SENS*® on connection A or B and the compressed air supply on the remaining connection.

[2] Depending on the temperature, either compressed, non-purified and humid ambient air or purified and dehumidified air it to be used. If the air sampling system and pipe system are located in areas below the freezing point, purified an dehumidified compressed air is to be used.

The manual blowing-out process on the pipe system is executed with the following steps:

1. For the blowing-out of the pipe system, close the necessary compressed air supply (compressor or mobile blowing-out equipment) using the quick closure on the 3-way ball valve of the pipe system to be blown out.
2. Separate the pipe system to be blown out from the TITANUS *TOP · SENS* with the 3-way ball valve by setting the lever of the ball valve accordingly.
3. Blow the pipe system out manually for approximately 10 seconds.
4. Set the lever of the ball valve such that the device is neither connected with the pipe system nor with the connection for the 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 smoke extraction system.
5. Connect the blown-out pipe system with the TITANUS *TOP · SENS* again within 10 additional seconds by setting the ball valve accordingly.

NOTE

A single blowing-out process can be completed within 50 seconds. If within this time the device is still connected to the pipe system, then the malfunction message “airflow sensor module malfunctioning” will not be evaluated. If another blowing-out process is necessary, then the procedure described above should be repeated **at the earliest after 120 seconds**.

6.7 Water Separators

Standard

The standard water separator is installed using a PG20 screw connection and a T-piece between the TITANUS *TOP · SENS*® and the pipe system.

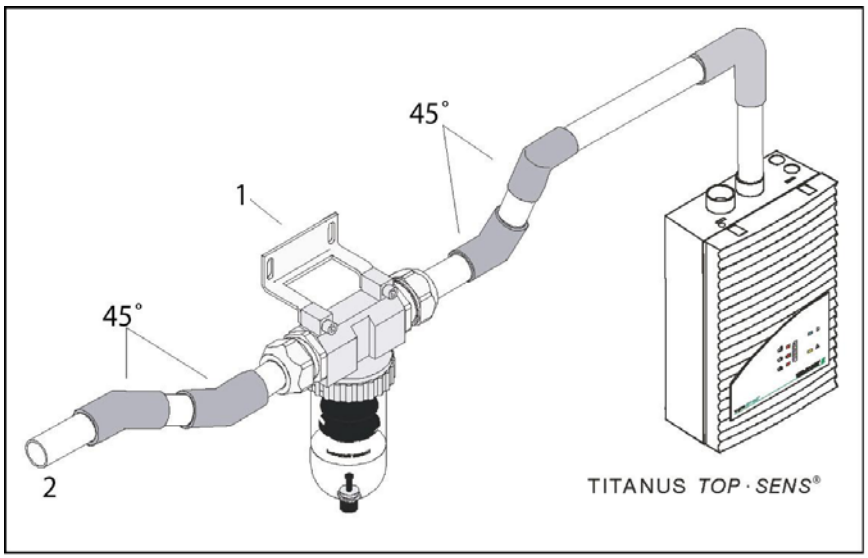


Fig. 6.9: Installation of the type II water separator in the pipe syste

1 Water separator Type II
2 Pipe system

Water Separator Type II

The type II water separator must be installed at the lowest point of the pipe system in front of the air filter and the TITANUS *TOP · SENS*®. During installation, pay attention to the correct throughflow direction (arrow on plastic clip). For connection of the type II water separator to the pipe system, two 45° angles (included in the scope of delivery) must be used on both sides to offset the depth compensation.

Connection

Prepare the pipe system with two 45° angles for connection to the type II water separator and connect it to the PG screw connections.

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

6.8 Detonation Safety Barrier

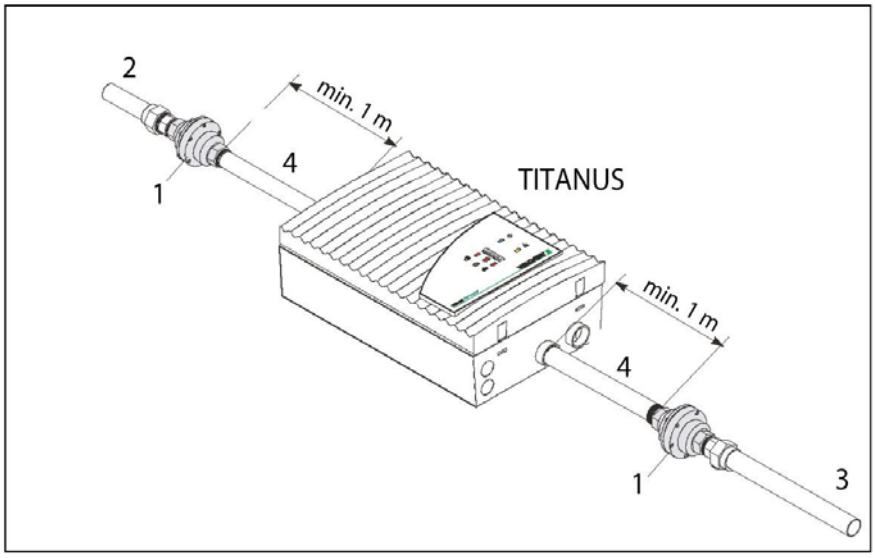


Fig. 6.10: Installation of the detonation safety barrier on the pipe system and the air return

1 Detonation safety barrier
2 Connection air return
3 Connection pipe system
4 Connection metal pipe

The detonation safety barrieres are installed at a minimum distance of **1 m** from the smoke extraction system in the pipe system and the air return. The detonation safety barrier is stuck together with the help of the transition screw connection on the side of the pipe system or the air return and connected to the TITANUS *TOP · SENS*® on the side of the device with a steel pipe (see Fig. 6.9). The connection between the detonation safety barrier and the steel pipe/transition screw connection is made using ¾“ screw threads.

NOTE

To create a gas-tight connection between the detonation safety barrier and steel pipe/transition screw connection, a sealing band or thread seal must be used.

For installation of the detonation safety barrier, the throughflow direction is secondary.

6.9 Test Adapter

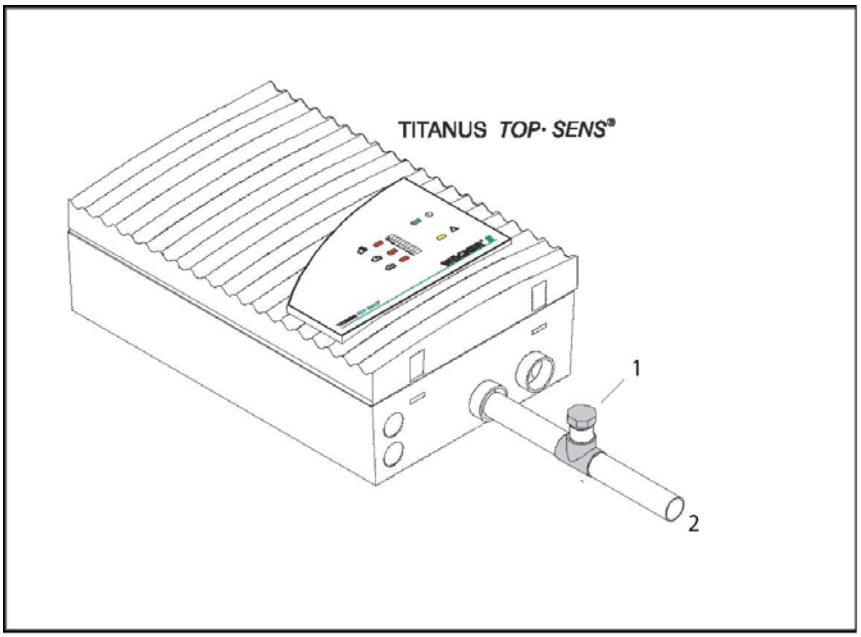


Fig. 6.11: Installation of the test adapter in the pipe system

1 Test adapter
2 Connection pipe system

Optionally, a test adapter can be stuck in the pipe system in the immediate vicinity of the smoke extraction system. This is recommended especially for applications where the smoke extraction system must be fastened tightly. Otherwise, the pipe system connection can be pulled out for test purposes and the test pipe connected directly to the TITANUS *TOP · SENS*® .

The test adapter must always be closed during normal operation and is only opened for maintenance and service purposes in order to let test gas or smoke in.

WARNING

After testing the detector module in the smoke extraction system and the alarm transmission, the test adapter must be closed again; otherwise there will be an airflow malfunction!

7 Start-Up


NOTE

For a later evaluation of the airflow value, adhere to the calibration type (see Chapter 7.1), start-up temperature, air pressure and height above NN in the test protocol (see appendix).

Test Settings Before start-up, test the settings of the TITANUS *TOP·SENS*® (Chapter 5.4). Then connect the device to the power supply.


NOTE

The detector module of the TITANUS *TOP · SENS*® is ready for operation after approximately 1 minute.

For set-up of the TITANUS *TOP·SENS*®, install the pipe system completely and connect it.

Final Test Test whether…

1. The pipe system is connected securely with the pipe connection of the TITANUS *TOP · SENS*®
2. All pipe fittings are stuck together and the pipe system is tight. For this, close all suction openings (e.g. with duct tape). Then measure the airflow at the opening for the air return or with the help of a test adapter installed immediately in front of the device in the suction pipe (see Chapter 2.3).
3. The correct suction-reducing film sheets are stuck on the suction openings.


NOTE

After calibration of the airflow sensor (see Chapter 7.1 “Calibrating the Airflow Sensor”), no more changes may be made to the pipe system.

If changes are necessary later, the airflow sensor must be calibrated again.

7.1 Calibrating the Airflow Sensor

NOTE

To be able to calibrate the TITANUS *TOP · SENS*® correctly to the connected pipe system, the device must have been operating for at least 30 minutes.

Air Pressure Calibration

The air pressure-independent calibration is described in Chapter 7.1.1, restrictions for this simplified procedure are described in Chapter 4.3.

For an air pressure-dependent calibration (Chapter 7.1.2), use the air pressure-correction tables in the appendix.

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

7.1.1 Air Pressure-Independent Calibration

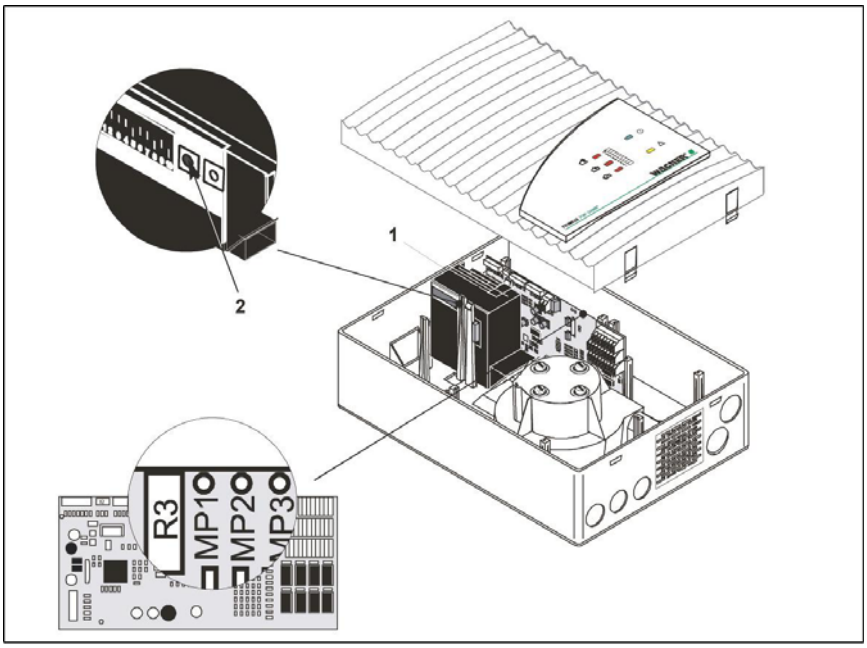


Fig. 7.1: Air pressure-independent calibration of the airflow sensor

1 Detector module
2 Flow-Init button S2

1. Make sure that the device has been operating for at least 30 minutes.
2. Check the voltage at the measuring points MP2 (+) and MP3 (-). Note the polarity. On the measuring device, select the “V-DC” range. The voltage at the measuring points is 1.2 V by default.
3. If this is not the case, set this value via the trimming potentiometer R3 with the help of a small screwdriver.
4. Press the Flow-Init button S2 on the detector module of the TITANUS *TOP · SENS*® (see Fig. 7.1).

5. After you have pressed the S2 button, close the housing of the TITANUS *TOP · SENS*® and check that it sits correctly.

The learning phase of the TITANUS T*OP · SENS*® takes approximately 5 seconds. During the learning phase, the operating LED blinks. The alarm detection is completely functional. In this time, however, no airflow influences may occur. After completing initialization, the operating LED lights up permanently and the airflow sensor has determined an actual value for the connected pipe system.

NOTE

If the green operating LED becomes a steady green light during the initialization phase, then the initialization was not successful and the device will produce a collective malfunction (malfunction relay drop-off). The precise cause of the cancellation can be read out using the *DIAG 2* diagnostic software.

7.1.2 Air Pressure-Dependent Calibration

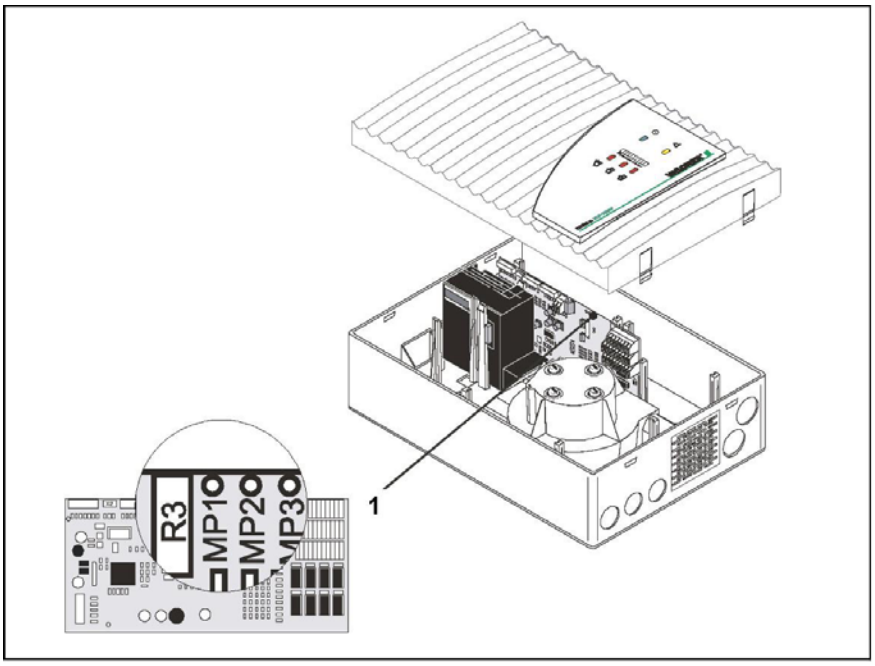


Fig. 7.2: Air pressure-dependent calibration of the airflow sensor
1 Motherboard

For the air pressure-dependent calibration of the airflow sensor a barometer[1] and a multimeter are required. The following steps are required:

1. Make sure that the device has been operating for at least 30 minutes.

[1] Recommendation: digital precision pocket barometer GPB 1300, Greisinger electronic GmbH

2. Determine the amount above NN, air pressure, and ambient temperature of the installation location and enter these values in the test protocol.
3. Using the air pressure-correction tables (see appendix), determine the calibration value to which the airflow sensor must be set and enter this in the test protocol. When selecting the air pressure-correction table, note the pipe planning.
4. Connect the multimeter to the measuring points MP2 (+) and MP3 (-) (see **Fig. 7.**2). Note the polarity. On the measuring device, select the “V-DC” range. The voltage at the measuring points is 1.2 V by default.
5. Using the trimming potentiometer, set R3 to the calibration value from the air pressure-correction table with the help of a small screwdriver .
6. Closing the housing of the TITANUS *TOP · SENS*® and make sure it is sitting correctly.

7.2 Testing the Detector Module and Alarm Transmission


NOTE

Notice all datas in the test protocol which are checked in the following chapters.

Loosen the detector module and test the transmission path to the fire panel as follows:

1. Spray test aerosol either in the first suction opening or in the test adapter of the pipe system of the TITANUS *TOP · SENS*®.
2. Use the following table.

Check whether…	**If this is not the case, ...**
... the alarm is displayed on the smoke extraction system.	1. Test whether the display board is connected. 2. There is a defect in the smoke extraction system. 3. Exchange the detector module.
... the alarm is transmitted to the fire panel and reported on the appropriate line	1. Check the transmission paths.


NOTE

To speed up alarm evaluation during testing, the ***LOGIC · SENS***-switch S1-10 should be set to "OFF" (see Chapter 5.3 “Settings“). After testing is complete, set back to “ON”!

7.3 Testing Malfunction Transmission

NOTE

The following steps can only be executed after a successful airflow calibration according to Chapter 7.1 “Calibrating the Airflow Sensor.”

Check the malfunction transmission.

During testing, check the airflow monitoring (according to the following section) and see whether the malfunction is displayed on the TITANUS *TOP · SENS*® and if necessary on the fire panel.

7.4 Testing the Airflow Monitoring

Pipe Break Check the recognition of a pipe break:

1. Loosen the pipe from the connection to the TITANUS *TOP · SENS*® or open the test adapter.
2. Check whether the malfunction display on the smoke extraction system lights up.
3. Optionally, check the data of the airflow sensor with the *DIAG* diagnostic software and a PC or laptop.
4. Enter the result in the test protocol.

Blockage Check the recognition of a blockage:

1. Close – depending on the planned airflow monitoring – the corresponding number of suction openings with some duct tape.
2. Check whether the malfunction display on the smoke extraction system lights up.
3. Optionally, check the data of the airflow sensor with the *DIAG* diagnostic software and a PC or laptop.
4. Enter the result in the test protocol.

NOTE

A pipe break or pipe blockage is displayed by a blink code or a LED on the detector module.

- Break: blink x 3
- Blockage: blink x 2

The corresponding blink code is repeated every two seconds.

Debugging If the airflow malfunctions are not recognized correctly by the device, proceed as follows:

Check whether…

1. All borings are free,
2. The pipe system has breaks or tears,
3. All pipe connections are tight,
4. The blower can blow out freely,
5. The correct suction-reducing film sheets were used.

If no flaws are detected, the functionality of the TITANUS *TOP · SENS*® or the airflow sensor will be checked using the test pipe or diagnostic software (see Chapter 7.5 "Functional Test of TITANUS *TOP · SENS*®").

7.5 Functional Test of the TITANUS *TOP · SENS*®

If the TITANUS *TOP · SENS*® cannot be calibrated, check the functionality with the help of the test pipe and a digital manometer or with the help of the diagnostic software. For this, the TITANUS T*OP · SENS*® must have been in operation for at least 30 minutes.

7.5.1 Preparations for the Functional Test

1. Set the switch on the detector module (see Fig. 5.2) according to the following table. The settings in **bold** designate **non-standard** settings.

Switch S1 (detector module) detector module setting	
Contact 3	Contact 4
on	off
Alarm delay time 10 seconds	

Switch S1 (detector module) airflow monitoring			
Contact 5	Contact 6	Contact 7	Contact 8
off	off	**off**	**on**
Activation threshold (level III)		**Delay time 0.5 min**	

Switch S1 (detector module) malfunction message
Contact 9
off (not saving)

Switch S1 (detector module) *LOGIC · SENS*
Contact 10
off (no *LOGIC · SENS)*

2. Loosen the pipe system from the TITANUS *TOP · SENS*®.

3. Connect the test pipe.
4. Connect the pressure measuring hose to the adapter connection B.
5. Connect the 4-pin plug of the adapter to the digital manometer and switch it on.

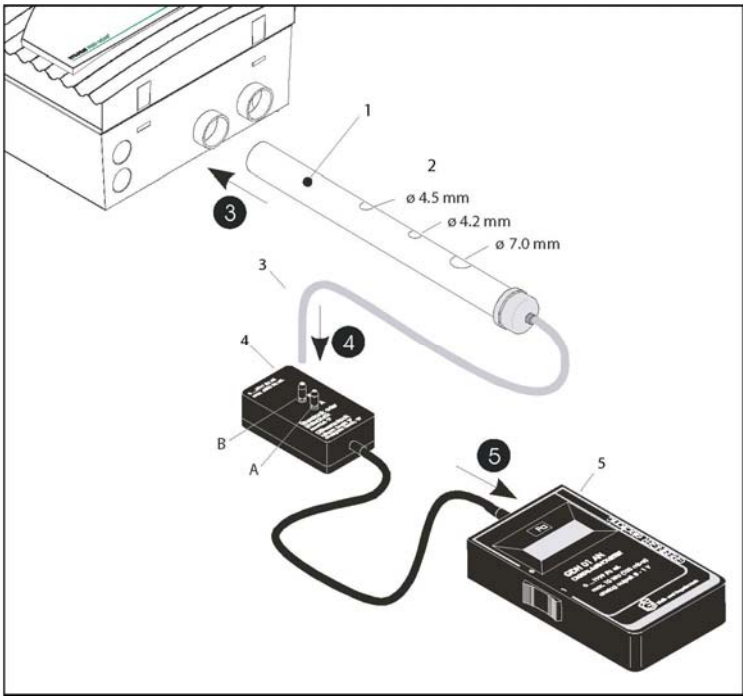


Fig. 7.3: Testing the functionality of the TITANUS *TOP · SENS*®

1 Test pipe
2 Suction borings
3 Pressure measuring hose
4 Adapter
5 Digital manometer

NOTE

For the TITANUS T*OP · SENS*® 2 the preparation for the functional test (steps 1 – 4) and the following functional test (steps 1 – 7) must be executed for both pipe systems.

7.5.2 Execution of the Functional Test

The functional test can be executed with or without a digital manometer. The complete test is described below. If during testing of the TITANUS *TOP · SENS*® deviations from the described procedure occur, the device or its airflow sensor is defective.

1. Make sure that the device has been operating for at least 30 minutes.
2. Close all the test pipe's suction openings with some duct tape. The negative pressure generated in the device must, after a short run-up time, amount to 270 Pa with a set blower voltage of 6.9 V and with 9 V, approximately 480 Pa.

3. Free up the 7.0 mm and 4.2 mm suction borings on the test pipe again.
   Press the Init button S2 on the detector module and close the housing cover. The operating LED blinks and the malfunction LED must go out.
4. After the learning phase (approximately 5 seconds), close the 4.2 mm suction boring of the test pipe with some duct tape. After approximately 75 seconds, the malfunction display must blink.
5. Open the 4.2 mm suction boring again. After a few seconds, the blink code of the LED must go out.
6. Open the 4.6 mm suction boring on the test pipe again. After approximately 85 seconds, the malfunction display must start to blink.
7. Close the 4.6 mm suction boring again. The malfunction display must go out again after a few seconds.


NOTE

A pipe break or pipe blockage is displayed by a blink code or a LED on the detector module.

- Break: blink x 3
- Blockage: blink x 2

The corresponding blink code is repeated every two seconds.

DIAG 2 To execute the functional test the diagnostic software *DIAG 2* can be used. The following steps must be noted:

1. Install the diagnostic software on a laptop or PC with a serial interface. WINDOWS 95, 98, ME, 2000 and NT 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.
2. The TITANUS *TOP · SENS*® is connected to the PC (COM1, COM2) via the “Diag.“ connection on the motherboard using the included diagnostic cable.
3. The diagnostic software is started.
4. The current TITANUS *TOP · SENS*® data is displayed on the PC’s screen.

After a possible debugging, the settings on the switch S1 must be set back to their original state.

Repeat the start-up from Chapter 7.1 “Airflow Sensor Calibration."


NOTE

After the conclusion of start-up, the set values must be collected and saved using the *DIAG* diagnostic software. A printout of the set values should be placed in the project folder.

8 Maintenance

8.1 Visual Check

Test whether…

- with free accessibility to the pipe system, it is installed securely and undamaged,
- the suction openings of the pipe system are free,
- suction pipe and connection cable are connected tightly,
- the device bracket – if present – is fastened properly,
- the smoke extraction system exhibits damage (for this, see the blink code table).

8.2 Blink Code Table

The motherboard is equipped with two LEDs, which with the help of a blink code displays different malfunctions and device states:

Blink code LEDs at the motherboard	
blink x 1	Airflow-Init active
blink x 2	Airflow too small (blockage)
blink x 3	Airflow too great (break)
Blink code LED at the detector module	
permanent blink	Data communication between detector modules and motherboard active
permanent light	Hardware defect in the detector module

8.3 Detector Module and Alarm Transmission

Proceed according to Chapter 7.2 “Testing the Detector Module and Alarm Transmission.” Also check the detector module visually for exterior soiling or damage and exchange it if necessary.

NOTE

A hardware defect in the detector module is indicated by a permanently-lit detector module LED.

8.4 Pipe System

Check the pipe system and the suction openings for blockage in areas where dust particles or icing are possible. If necessary, blow out the pipe system and suction openings with compressed air. For this, use a mobile can of compressed air (blowing-out system) or use the manual blowing-out system installed on location.

WARNING

Before blowing out the pipe system, separate the TITANUS *TOP · SENS*® from the pipe system since otherwise the airflow sensor will be damaged.

Blow-out

The compressed air supply has to be connected to the pipe system in a way that only the pipe system is blown out. The smoke extraction system and the downstream accessories (e.g. air filter) must not be blown out.

At the end of each pipe branch a check valve (available from the manufacturer) has to be mounted. The check valve prevents damages of the suction openings and secures that dirt from the inside of the the pipe system is blown out. To avoid rippings of the suction reducing film sheets in deep-freeze areas, the use of special deep-freeze suction reducing film sheets (available from the manufacturer) is recommended in these areas.

The compressed air supply and connection have to be arranged in a way that inside the pipe system a minimum of 0.7 bar per pipe branch is provided. This means a minimum of 0.7 bar fort he I-pipe, a minimum of 1.4 bar for the U-pipe and a minimum of 2.8 bar for the UU-pipe. The smallest flow section possible inside the compressed air connection has to be considered each. If the compressed air supply is, for example, connected by a coupling box with a flow section of 7.2 mm, the pressure ratio is 1:9 due to the larger flow section inside the pipe system (21.4 mm) (If there is, for example, an air pressure of 8 bar in the coupling box, it would drop down to about 0.9 bar because of the larger flow section inside the pipe system. In this case, the pressure would be sufficient for the I-pipe system but not for the U- or UU-pipe system).

In areas in which the contamination of the pipe system and suction openings is very likely, the compressed air supply should be connected with a three-way ball valve in-between. In areas with heavy contamination (e.g. recycling facilities), the use of an automatic blow-out device and the installation of shut-off valves / pneumatic valves (available from the manufacturer) are recommended.

If a blow-out is not necessary within short periods (areas with little contamination), a mobile blow-out kit including a refillable compressed air can is available from the product range.

8.5 Checking the Airflow Sensor Calibration

Check the airflow sensor value with the *DIAG* diagnostic software.

Functional principle

During initialization of the connected pipe system, the device saves the measured actual value of the airflow as a nominal 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 Chapter 4.3, section “Adjusting the Airflow Sensitivity"), the current airflow value during operation can fluctuate around this nominal 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 nominal values are represented in the diagnostic software. The boundaries (maximum/minimum) always correspond to a deviation of ±100 % from the saved nominal value.

Check the deviation of the actual value from the nominal value. If there is a deviation of > ±70 %, then you should make a prophylactic check of the pipe system (on this, see the section “Debugging Airflow Malfunction,“ next page).

NOTE

The current airflow value cannot only deviate due to a malfunction of the pipe system (break or blockage), but also due to air pressure and temperature fluctuations in the environment.

Air pressure-dependent To ensure long-term malfunction-free operation of the device, the airflow sensor must be calibrated depending on the air pressure. Only with this type of calibration do low air pressure fluctuations remain within the monitoring window and thus in the permissible tolerance range.

Air pressure-independent

If the sensor calibration is carried out regardless of air pressure, fluctuations in the air pressure can cause undesired airflow malfunctions. The calibration of the airflow sensor may only be carried out this way if you ensure that no fluctuations in air pressure will occur in the immediate environment.

WARNING

If you cannot ensure that no fluctuations in air pressure will occur in the immediate environment, then you must absolutely calibrate the airflow sensor depending on the air pressure.

Elimination of airflow malfunction

If the airflow calibration has been executed 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 type of disturbance value than air pressure or temperature fluctuation exists.

WARNING

In case of a defect in the airflow monitoring, only authorized personnel may undertake the exchange of the detector module!

1. In this case check the pipe system for leakage and blockages (see Chapter 7.4, section “Debugging”).
2. If this check reveals no flows, then check the airflow monitoring by connecting the test pipe and executing the functional test described in Chapter 7.5.2.
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 calibrated again.

NOTE

You must absolutely adhere to the type of calibration (air pressure-dependent or air pressure-independent) and if necessary the values of air pressure, height above NN, and set voltage on MP1/MP4 in the test protocol.

4. Observe the current airflow value during ongoing maintenance or check it at the latest upon next inspection.
5. If the nominal value is similar to the previous one, then disturbing environmental influences are the cause of the deviation. If these negative influences on the airflow monitoring cannot be suppressed, the next less-sensitive threshold should be set.

TIP

Using diagnostic software, all saved and current diagnostic data as well as the settings undertaken using the DIL switches can be saved as a file. Rename the file so that with the next test you will be able to compare the newly read-out values.
For more information on the *DIAG* diagnostic software, see relevant documentation.

8.6 Airflow Monitoring

A pipe break or pipe blockage is indicated for each detector module via the blink code of an LED on the motherboard. Check the airflow monitoring as described in Chapter 7.4 “Checking the Airflow Monitoring.”

8.7 Malfunction Transmission

A malfunction is indicated on the TITANUS *TOP · SENS*® and if necessary on the fire panel.

Proceed according to Chapter 7.3 “Checking Malfunction Transmission.”

8.8 Maintenance Intervals

Maintenance includes the regular execution of inspections and maintenance. The smoke extraction systems should be checked on start-up and then quarterly. At each fourth check, more comprehensive checks should be made, as described below:

- Quarterly test **Inspection**
- Quarterly test **Maintenance + quarterly inspection**

Type of test	Measure	Additional information in Chapter
Inspection	Visual check	8.1
	Detector module and alarm transmission	8.3
	Check of the pipe system	8.4
	Check of the airflow sensor calibration	8.5
	Test of malfunction transmission	7.3
Maintenance and quarterly inspection	Visual check	8.1
	Detector module and alarm transmission	8.3
	Check of the pipe system	8.4
	Check of the airflow sensor calibration	8.5
	Test of malfunction transmission	7.3
	Test of the airflow monitoring	7.4

Air Pressure Correction Table for Calibration of the TITANUS *TOP · SENS*® TT-1 and *TOP · SENS*® TT-2

Equipment Protection

Height [m above NN]	Air pressure [hPa] at a height of														
0	973	978	983	988	993	998	1003	1008	1013	1018	1023	1028	1033	1038	1043
50	967	972	977	982	987	992	997	1002	1007	1012	1017	1022	1027	1032	1037
100	961	966	971	976	981	986	991	996	1001	1006	1011	1016	1021	1026	1031
150	954	959	964	969	974	979	984	989	994	999	1004	1009	1014	1019	1024
200	948	953	958	963	968	973	978	983	988	993	998	1003	1008	1013	1018
250	942	947	952	957	962	967	972	977	982	987	992	997	1002	1007	1012
300	936	941	946	951	956	961	966	971	976	981	986	991	996	1001	1006
350	930	935	940	945	950	955	960	965	970	975	980	985	990	995	1000
400	924	929	934	939	944	949	954	959	964	969	974	979	984	989	994
450	918	923	928	933	938	943	948	953	958	963	968	973	978	983	988
500	912	917	922	927	932	937	942	947	952	957	962	967	972	977	982
550	906	911	916	921	926	931	936	941	946	951	956	961	966	971	976
600	900	905	910	915	920	925	930	935	940	945	950	955	960	965	970
650	894	899	904	909	914	919	924	929	934	939	944	949	954	959	964
700	888	893	898	903	908	913	918	923	928	933	938	943	948	953	958
750	882	887	892	897	902	907	912	917	922	927	932	937	942	947	952
800	877	882	887	892	897	902	907	912	917	922	927	932	937	942	947
850	871	876	881	886	891	896	901	906	911	916	921	926	931	936	941
900	865	870	875	880	885	890	895	900	905	910	915	920	925	930	935
950	860	865	870	875	880	885	890	895	900	905	910	915	920	925	930
1000	854	859	864	869	874	879	884	889	894	899	904	909	914	919	924
1050	848	853	858	863	868	873	878	883	888	893	898	903	908	913	918
1100	843	848	853	858	863	868	873	878	883	888	893	898	903	908	913
1150	837	842	847	852	857	862	867	872	877	882	887	892	897	902	907
1200	832	837	842	847	852	857	862	867	872	877	882	887	892	897	902
1250	827	832	837	842	847	852	857	862	867	872	877	882	887	892	897
1300	821	826	831	836	841	846	851	856	861	866	871	876	881	886	891
1350	816	821	826	831	836	841	846	851	856	861	866	871	876	881	886
1400	810	815	820	825	830	835	840	845	850	855	860	865	870	875	880
1450	805	810	815	820	825	830	835	840	845	850	855	860	865	870	875
1500	800	805	810	815	820	825	830	835	840	845	850	855	860	865	870
1550	795	800	805	810	815	820	825	830	835	840	845	850	855	860	865
1600	789	794	799	804	809	814	819	824	829	834	839	844	849	854	859
1650	784	789	794	799	804	809	814	819	824	829	834	839	844	849	854
1700	779	784	789	794	799	804	809	814	819	824	829	834	839	844	849
1750	774	779	784	789	794	799	804	809	814	819	824	829	834	839	844
1800	769	774	779	784	789	794	799	804	809	814	819	824	829	834	839
1850	764	769	774	779	784	789	794	799	804	809	814	819	824	829	834
1900	759	764	769	774	779	784	789	794	799	804	809	814	819	824	829
1950	754	759	764	769	774	779	784	789	794	799	804	809	814	819	824
2000	749	754	759	764	769	774	779	784	789	794	799	804	809	814	819
2050	744	749	754	759	764	769	774	779	784	789	794	799	804	809	814
2100	739	744	749	754	759	764	769	774	779	784	789	794	799	804	809
2150	734	739	744	749	754	759	764	769	774	779	784	789	794	799	804
2200	729	734	739	744	749	754	759	764	769	774	779	784	789	794	799
2250	725	730	735	740	745	750	755	760	765	770	775	780	785	790	795
2300	720	725	730	735	740	745	750	755	760	765	770	775	780	785	790
2350	715	720	725	730	735	740	745	750	755	760	765	770	775	780	785
2400	710	715	720	725	730	735	740	745	750	755	760	765	770	775	780
Calibration to [mV]	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.00**	**1.10**	**1.20**	**1.30**	**1.40**	**1.50**	**1.60**	**1.70**	**1.80**	**1.90**

Air Pressure Correction Table
for Calibration of the TITANUS *TOP · SENS*® TT-1 and *TOP · SENS*® TT-2

Space Protection (I-Pipe System)

Height [m above NN]	Air pressure [hPa] at a height of														
0	973	978	983	988	993	998	1003	1008	1013	1018	1023	1028	1033	1038	1043
50	967	972	977	982	987	992	997	1002	1007	1012	1017	1022	1027	1032	1037
100	961	966	971	976	981	986	991	996	1001	1006	1011	1016	1021	1026	1031
150	954	959	964	969	974	979	984	989	994	999	1004	1009	1014	1019	1024
200	948	953	958	963	968	973	978	983	988	993	998	1003	1008	1013	1018
250	942	947	952	957	962	967	972	977	982	987	992	997	1002	1007	1012
300	936	941	946	951	956	961	966	971	976	981	986	991	996	1001	1006
350	930	935	940	945	950	955	960	965	970	975	980	985	990	995	1000
400	924	929	934	939	944	949	954	959	964	969	974	979	984	989	994
450	918	923	928	933	938	943	948	953	958	963	968	973	978	983	988
500	912	917	922	927	932	937	942	947	952	957	962	967	972	977	982
550	906	911	916	921	926	931	936	941	946	951	956	961	966	971	976
600	900	905	910	915	920	925	930	935	940	945	950	955	960	965	970
650	994	899	904	909	914	919	924	929	934	939	944	949	954	959	964
700	888	893	898	903	908	913	918	923	928	933	938	943	948	953	958
750	882	887	892	897	902	907	912	917	922	927	932	937	942	947	952
800	877	882	887	892	897	902	907	912	917	922	927	932	937	942	947
850	871	876	881	886	891	896	901	906	911	916	921	926	931	936	941
900	865	870	875	880	885	890	895	900	905	910	915	920	925	930	935
950	860	865	870	875	880	885	890	895	900	905	910	915	920	925	930
1000	854	859	864	869	874	879	884	889	894	899	904	909	914	919	924
1050	848	853	858	863	868	873	878	883	888	893	898	903	908	913	918
1100	843	848	853	858	863	868	873	878	883	888	893	898	903	908	913
1150	837	842	847	852	857	862	867	872	877	882	887	892	897	902	907
1200	832	837	842	847	852	857	862	867	872	877	882	887	892	897	902
1250	827	832	837	842	847	852	857	862	867	872	877	882	887	892	897
1300	821	826	831	836	841	846	851	856	861	866	871	876	881	886	891
1350	816	821	826	831	836	841	846	851	856	861	866	871	876	881	886
1400	810	815	820	825	830	835	840	845	850	855	860	865	870	875	880
1450	805	810	815	820	825	830	835	840	845	850	855	860	865	870	875
1500	800	805	810	815	820	825	830	835	840	845	850	855	860	865	870
1550	795	800	805	810	815	820	825	830	835	840	845	850	855	860	865
1600	789	794	799	804	809	814	819	824	829	834	839	844	849	854	859
1650	784	789	794	799	804	809	814	819	824	829	834	839	844	849	854
1700	779	784	789	794	799	804	809	814	819	824	829	834	839	844	849
1750	774	779	784	789	794	799	804	809	814	819	824	829	834	839	844
1800	769	774	779	784	789	794	799	804	809	814	819	824	829	834	839
1850	764	769	774	779	784	789	794	799	804	809	814	819	824	829	834
1900	759	764	769	774	779	784	789	794	799	804	809	814	819	824	829
1950	754	759	764	769	774	779	784	789	794	799	804	809	814	819	824
2000	749	754	759	764	769	774	779	784	789	794	799	804	809	814	819
2050	744	749	754	759	764	769	774	779	784	789	794	799	804	809	814
2100	739	744	749	754	759	764	769	774	779	784	789	794	799	804	809
2150	734	739	744	749	754	759	764	769	774	779	784	789	794	799	804
2200	729	734	739	744	749	754	759	764	769	774	779	784	789	794	799
2250	725	730	735	740	745	750	755	760	765	770	775	780	785	790	795
2300	720	725	730	735	740	745	750	755	760	765	770	775	780	785	790
2350	715	720	725	730	735	740	745	750	755	760	765	770	775	780	785
2400	710	715	720	725	730	735	740	745	750	755	760	765	770	775	780
Calibration to [V]	**0.58**	**0.67**	**0.76**	**0.85**	**0.94**	**1.03**	**1.12**	**1.21**	**1.30**	**1.39**	**1.48**	**1.57**	**1.66**	**1.75**	**1.84**

Air Pressure Correction Table for Calibration of the TITANUS *TOP · SENS*® TT-1 and *TOP · SENS*® TT-2

Space Protection (U, Double-U, and H-Pipe System)

Height [m above NN]	Air pressure [hPa] at a height of														
0	973	978	983	988	993	998	1003	1008	1013	1018	1023	1028	1033	1038	1043
50	967	972	977	982	987	992	997	1002	1007	1012	1017	1022	1027	1032	1037
100	961	966	971	976	981	986	991	996	1001	1006	1011	1016	1021	1026	1031
150	954	959	964	969	974	979	984	989	994	999	1004	1009	1014	1019	1024
200	948	953	958	963	968	973	978	983	988	993	998	1003	1008	1013	1018
250	942	947	952	957	962	967	972	977	982	987	992	997	1002	1007	1012
300	936	941	946	951	956	961	966	971	976	981	986	991	996	1001	1006
350	930	935	940	945	950	955	960	965	970	975	980	985	990	995	1000
400	924	929	934	939	944	949	954	959	964	969	974	979	984	989	994
450	918	923	928	933	938	943	948	953	958	963	968	973	978	983	988
500	912	917	922	927	932	937	942	947	952	957	962	967	972	977	982
550	906	911	916	921	926	931	936	941	946	951	956	961	966	971	976
600	900	905	910	915	920	925	930	935	940	945	950	955	960	965	970
650	994	899	904	909	914	919	924	929	934	939	944	949	954	959	964
700	888	893	898	903	908	913	918	923	928	933	938	943	948	953	958
750	882	887	892	897	902	907	912	917	922	927	932	937	942	947	952
800	877	882	887	892	897	902	907	912	917	922	927	932	937	942	947
850	871	876	881	886	891	896	901	906	911	916	921	926	931	936	941
900	865	870	875	880	885	890	895	900	905	910	915	920	925	930	935
950	860	865	870	875	880	885	890	895	900	905	910	915	920	925	930
1000	854	859	864	869	874	879	884	889	894	899	904	909	914	919	924
1050	848	853	858	863	868	873	878	883	888	893	898	903	908	913	918
1100	843	848	853	858	863	868	873	878	883	888	893	898	903	908	913
1150	837	842	847	852	857	862	867	872	877	882	887	892	897	902	907
1200	832	837	842	847	852	857	862	867	872	877	882	887	892	897	902
1250	827	832	837	842	847	852	857	862	867	872	877	882	887	892	897
1300	821	826	831	836	841	846	851	856	861	866	871	876	881	886	891
1350	816	821	826	831	836	841	846	851	856	861	866	871	876	881	886
1400	810	815	820	825	830	835	840	845	850	855	860	865	870	875	880
1450	805	810	815	820	825	830	835	840	845	850	855	860	865	870	875
1500	800	805	810	815	820	825	830	835	840	845	850	855	860	865	870
1550	795	800	805	810	815	820	825	830	835	840	845	850	855	860	865
1600	789	794	799	804	809	814	819	824	829	834	839	844	849	854	859
1650	784	789	794	799	804	809	814	819	824	829	834	839	844	849	854
1700	779	784	789	794	799	804	809	814	819	824	829	834	839	844	849
1750	774	779	784	789	794	799	804	809	814	819	824	829	834	839	844
1800	769	774	779	784	789	794	799	804	809	814	819	824	829	834	839
1850	764	769	774	779	784	789	794	799	804	809	814	819	824	829	834
1900	759	764	769	774	779	784	789	794	799	804	809	814	819	824	829
1950	754	759	764	769	774	779	784	789	794	799	804	809	814	819	824
2000	749	754	759	764	769	774	779	784	789	794	799	804	809	814	819
2050	744	749	754	759	764	769	774	779	784	789	794	799	804	809	814
2100	739	744	749	754	759	764	769	774	779	784	789	794	799	804	809
2150	734	739	744	749	754	759	764	769	774	779	784	789	794	799	804
2200	729	734	739	744	749	754	759	764	769	774	779	784	789	794	799
2250	725	730	735	740	745	750	755	760	765	770	775	780	785	790	795
2300	720	725	730	735	740	745	750	755	760	765	770	775	780	785	790
2350	715	720	725	730	735	740	745	750	755	760	765	770	775	780	785
2400	710	715	720	725	730	735	740	745	750	755	760	765	770	775	780
Calibration to [V]	**0.54**	**0.63**	**0.73**	**0.82**	**0.92**	**1.01**	**1.11**	**1.20**	**1.30**	**1.40**	**1.49**	**1.59**	**1.68**	**1.78**	**1.87**

Test Protocol for the TITANUS *TOP · SENS*® Smoke Extraction System

Device number							
Serial number							
		Measurement value/set value	Measurement value/set value	Measurement value/set value	Measurement value/set value	Measurement value/set value	Measurement value/set value
Start-up							
Visual check	+ /-						
Negative pressure	[Pa]						
Sensitivity	[%/m]						
Alarm delay	[s]						
Malfunction delay	[min]						
Activation threshold	I/II/III/IV						
Malfunction saving	yes/no						
LOGIC SENS	yes/no						
Air pressure-dependent calibration	yes/no						
Air pressure-independent calibration	yes/no						
Height	[m above NN]						
Air pressure	[hPa]						
Temperature	[°C]						
Malfunction blockage							
LED blinks	+ /-						
Relay fails after delay time	+ /-						
Signal transmission to fire panel	+ /-						
Cause eliminated, LED off	+ /-						
Relay activates after drop below threshold	+ /-						
Cause eliminated, LED saved	+ /-						
Relay remains off	+ /-						
Malfunction break							
LED blinks	+ /-						
Relay fails after delay time	+ /-						
Signal transmission to fire panel	+ /-						
Cause eliminated, LED off	+ /-						
Relay activates after drop below threshold	+ /-						
Cause eliminated, LED saved	+ /-						
Relay remains off	+ /-						
Info-/Pre-/Main alarm							
LED blinks	+ /-						
Relay activates after delay time	+ /-						
Signal transmission to fire panel	+ /-						
LED saved	+ /-						
Relay saved	+ /-						

Legend: + in order / - not in order

Place:..... **Issuer:**.....

Date:..... **Signature:**.....

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