

# SIEMENS

## Planning of fire detection systems

## Telecommunication equipment

**Fire & Security Products**

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- These guidelines cover the special characteristics to be taken into consideration in the planning of fire detection systems for telecommunications systems and similar installations.
  - It supplements the documents in the other sections in the «CRP Fire protection systems» manual.
  - National guidelines and regulations have priority over the Cerberus guidelines.
  - The constructional requirements and the design of the technical installations such as electrical installations, heating and air conditioning equipment, elevators etc. which are to be defined in accordance with the national guidelines, are not or only partially covered to.
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## **Scope**

These guidelines supplement the general Cerberus planning guidelines and are used for planning fire detection systems in telecommunication centers.

The planning and installation of extinguishing systems are not covered by these guidelines.

# 1 Fire protection planning

## 1.1 General

Communication and information are important in both the private and public spheres, as well as for business. All important means of communication such as telephone, telefax, data transmission etc. are transmitted in large or small telecommunication centers by means of automatic equipment. Older telephone exchanges still operate with relay technology, while the newer ones employ the latest digital technology.

Not only do smooth business operations depend on the functioning of these centers, but public life is seriously affected by a breakdown.

A telecommunications center generally comprises:

- Switchgear rooms
- Main distributor
- Amplifier systems
- Emergency power supply
- Ancillary rooms

In order to ensure a uniform room environment, the switchgear rooms are equipped with a powerful air conditioning or ventilation system. The more frequent the change of air, the faster the smoke particles from a fire are carried away, so that a uniform or high concentration of smoke cannot build up.

Air conditioning concepts can vary. Unlike air conditioning units set up centrally in separate rooms, air conditioning equipment is often installed along the walls in the switchgear room itself. The fresh air enters the room via floor voids or direct.

In older telecommunication centers, switchgear cabling is laid from above via cable shelves. In newer systems, in particular in digitized telecommunication centers, cabling is laid via floor voids to the switchgear.

The fire protection concept and the measures to be applied must be worked out in close co-operation with the telecommunication authorities.

## 1.2 Fire dangers

The most common causes of fire are:

- malfunction in electrical equipment
- smoking or careless use of open fire
- carelessness on the part of personnel
- fires outside the sphere of the actual telecommunication center
- incendiarism

## 1.3 Fire protection concept

Protection measures must be so applied that:

1. A fire cannot spread unhindered
2. Fire cannot spread from outside to the telecommunications sector
3. Prompt fire-fighting is assured as well as
4. Effective smoke venting
5. A fire cannot put more than 1 cabinet out of commission
6. In spite of a fire, operations can be recommenced within the shortest possible time

## 1.4 Protection measures

- The formation of fire compartments within the telecommunication center such as:
  - switchgear room
  - power supply room
  - main distributor
  - cable entry
- Where walls are breached for cables to cross from one compartment to another, the point of entry must be sealed with fire-proof material
- A natural or installed means of smoke venting
- Fire points with portable fire extinguishers using gas as the extinguishant. No dry powder extinguishers may be used in the telecommunications sector or of the immediate vicinity

## 2 Planning fire detection systems

### 2.1 Area to be monitored

Basically, one should aim at complete monitoring of a building containing a telecommunication system. If only partial monitoring is provided, the following sectors must be covered:

- switchgear rooms
- main distributor
- amplifier
- emergency power supply
- power distribution

Floor and ceiling voids must always be monitored unless they contain no combustible material or sources of ignition. See the general planning guidelines, section 2 «CRP Fire protection systems».

### 2.2 Monitoring category

The fire detection system must be able to detect both open and smouldering fire. Smoke detectors must be used in accordance with «Monitoring category 3». See the general planning guidelines, section 2 «CRP Fire protection systems».

### 2.3 Room monitoring / equipment monitoring

Basically, room monitoring is essential.

**Equipment monitoring**, e.g. by mounting smoke detectors in the equipment itself, or by means of an air sampling system, **can supplement but never replace room monitoring**.

If equipment monitoring is provided, the detector density for room monitoring can be reduced. However, ceiling and floor voids must be monitored.

### 2.4 Sectors with fixed extinguishing systems

Equipment which is vital for the operation of a telecommunication center must be equipped with an automatic extinguishing system. Normally, individual units are fitted with small, autonomous CO<sub>2</sub> extinguishing systems which are activated automatically via the unit monitoring system or manually.



## 2.5 Choice of fire detector

**Ionization smoke detectors** must be used for the detection of **open fire**, e.g. involving waste paper.

**Smouldering fires**, in particular those involving electrical installations, can be best detected with **scattered-light smoke detectors** and **linear smoke detectors**.

With its measuring principle the linear smoke detector in several cases is superior to the scattered-light smoke detector. Therefore the additionally use of linear smoke detectors in high rooms or with a powerful air flow is recommended.

By using a **combination** of ionization and linear smoke detectors detection of all types of fire is guaranteed.

The **fresh air duct** should be monitored with an **FPK air duct detector unit** using ionization smoke detectors, in order that harmful combustion gases are not transported into the room.

## 2.6 Monitoring concept and detector arrangement

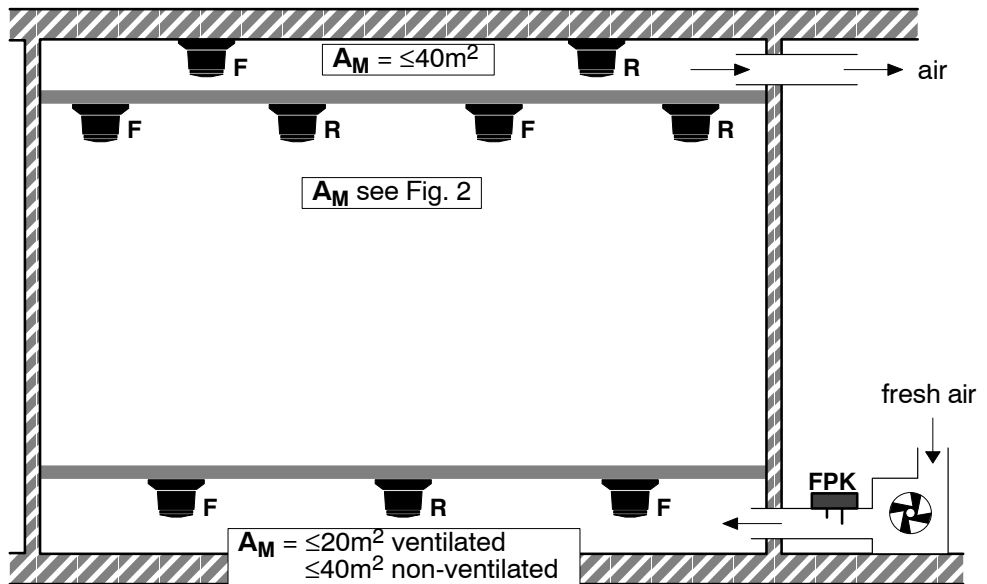
The following sections mainly deal with the rooms containing switchgear etc.

All other rooms such as offices, cable distribution rooms, workshops etc. can be designed according to the general planning guidelines.

### 2.6.1 Standard monitoring in normally ventilated rooms

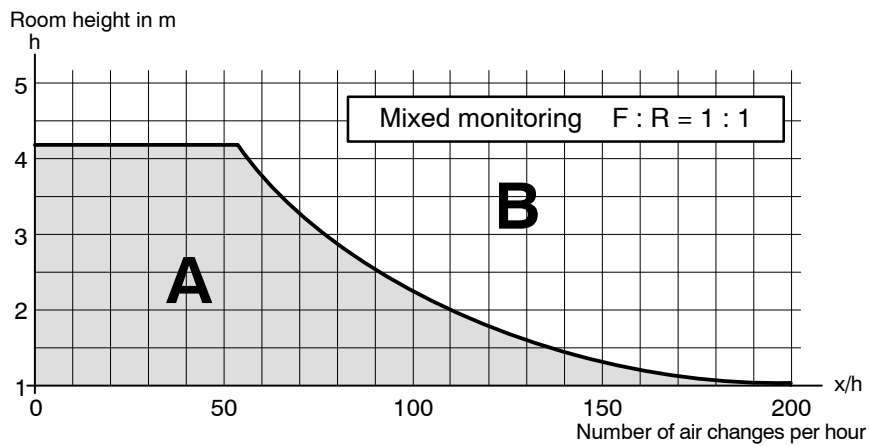
#### Measures:

- Ionization and scattered-light smoke detectors on the suspended ceiling (ratio 1:1)
- Ionization and scattered-light smoke detectors in floor void
  - ventilated floor void  $A_M \leq 20\text{m}^2$
  - non-ventilated floor void  $A_M \leq 40\text{m}^2$
- Monitoring of fresh air by FPK air duct detector unit with F detectors
- Monitor the ceiling void according to the general planning guidelines, 1:1 combination of F/R detectors.



F = Ionization smoke detector  
 R = Scattered-light smoke detector  
 FPK = Air duct detector

Fig. 1 Standard monitoring



A = Rooms with normal ventilation  
 without equipment monitoring 20- 25m<sup>2</sup> / detector  
 with equipment monitoring 40- 50m<sup>2</sup> / detector  
 B = Rooms with powerful ventilation

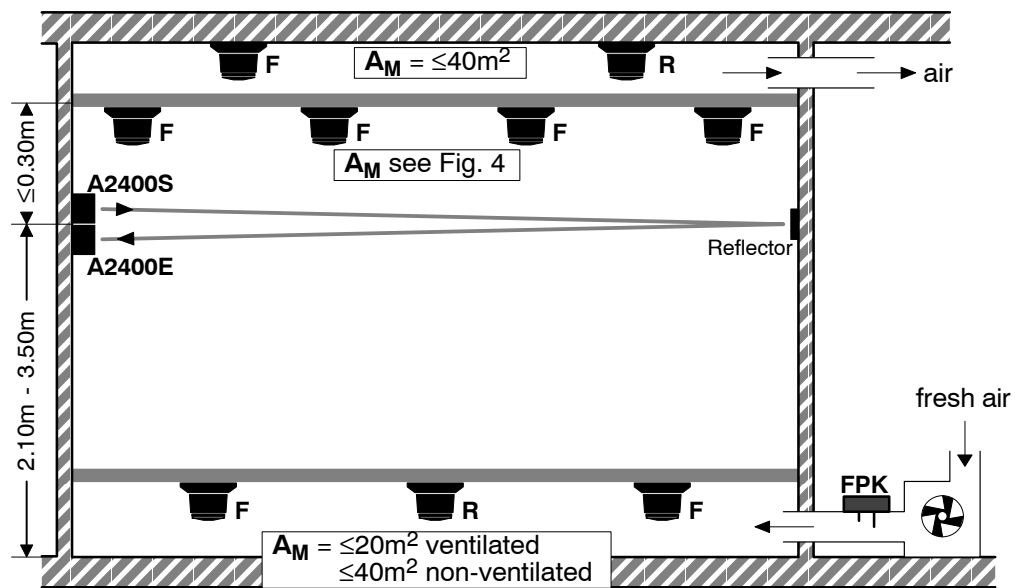
Fig. 2 Monitoring area in normally ventilated rooms

## 2.6.2 Monitoring in powerfully ventilated rooms

Particularly in rooms with powerful ventilation, smouldering fires can be detected better using linear smoke detectors.

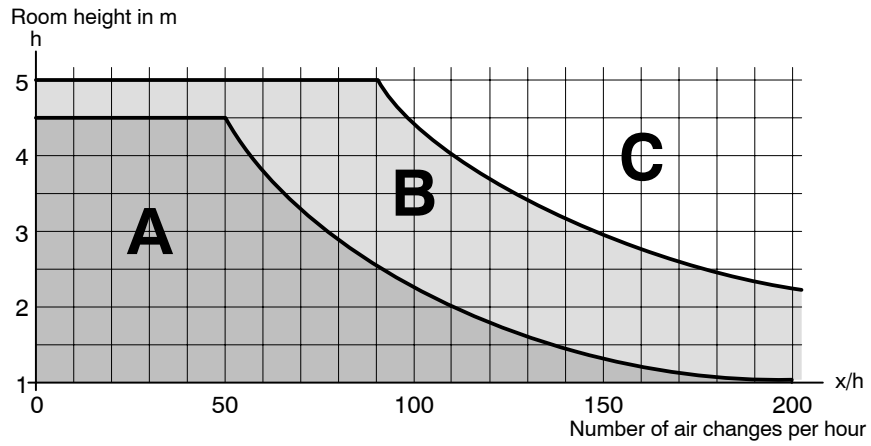
### Measures:

- Ionization smoke detectors mounted on the suspended ceiling (room monitoring)
- Linear smoke detectors from wall to wall, if the distance from wall to wall is  $\leq 30\text{m}$  with reflector (room monitoring)
- Ionization and light scattering smoke detectors in the floor void (ratio 1:1)  
 AM ventilated floor void  $\leq 20\text{m}^2$   
 AM non-ventilated floor void  $\leq 40\text{m}^2$
- Monitoring of fresh air duct by FPK air duct detector unit with F detectors
- Monitor the ceiling void according to the general planning guidelines, 1:1 combination of F/R detectors.



- F = Ionization smoke detector
- R = Scattered-light smoke detector
- FPK = Air duct detector
- A2400S = Emitter of the linear smoke detector
- A2400E = Receiver of the linear smoke detector

Fig. 3 Monitoring in powerfully ventilated rooms



A = Normally ventilated rooms  
 B = Medium ventilated rooms  
 monitoring area per detector: <math> < 25\text{m}^2 </math>

C = Powerfully ventilated rooms  
 monitoring area per detector: <math> < 40\text{m}^2 </math>

Parallel distance between linear smoke detectors = max. 5m

Fig. 4 Monitoring area in powerfully ventilated rooms

### 2.6.3 Cable shelves

If due to the number of cables, large areas are covered above the switchgear, a second level of monitoring must be provided.

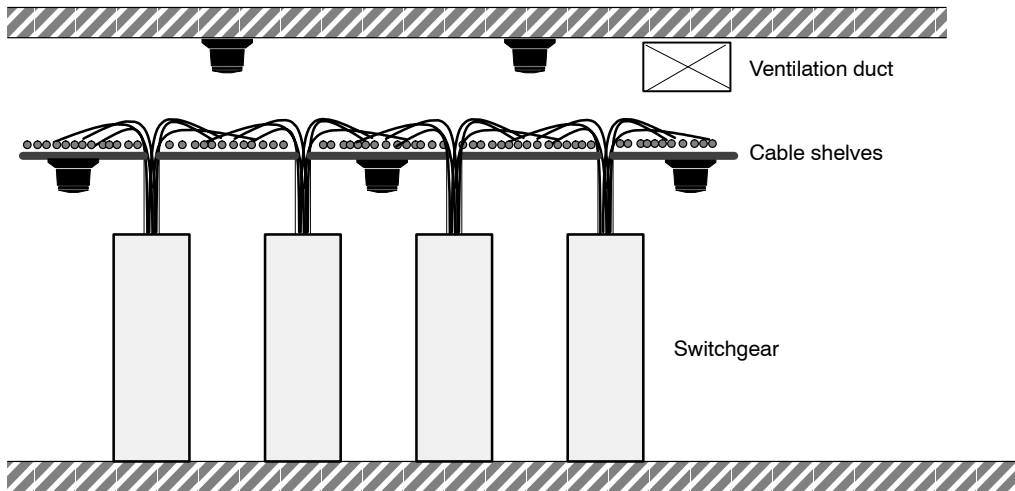


Fig. 5 Monitoring area of ceiling detectors

## 2.6.4 Arrangement of detectors in floor and ceiling voids

- Symmetrical detector arrangement
- Detectors must be accessible
- Install clearly visible external response indicators which indicate the status of detectors hidden in voids
- In floor voids use the MVH1 or MBH1 / MBH2 mounting brackets

Response indicator, *for dry applications:*

- APR9W housing
- FP1 front plate
- AJUT24 response indicator (collective addressed detectors)
- AJUT24Ex response indicator (individually addressed detectors)

Response indicator, *for wet applications:*

- APR10 housing
- AJUT24 or AJUT24Ex response indicators

Plexiglass disc AJR24, diameter 55mm

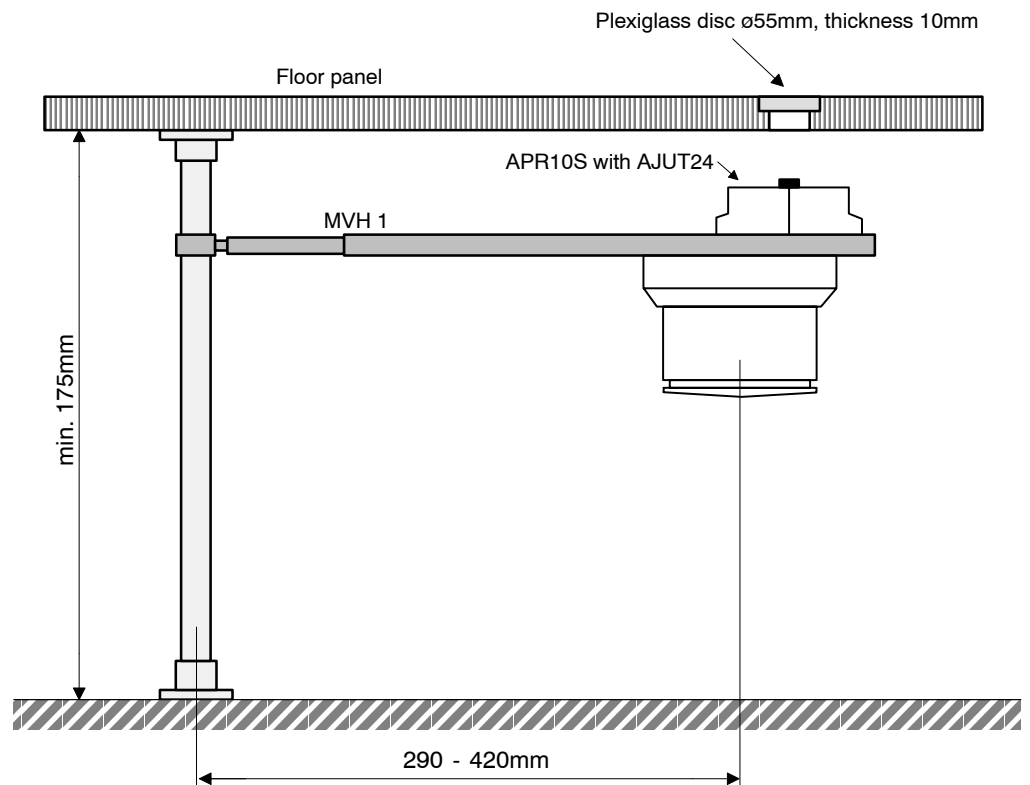


Fig. 6 MVH1 mounting bracket for the detectors in the floor

## 2.6.5 Equipment monitoring

Often detection is so fast that by automatically switching off the equipment, the fire extinguishes itself without causing serious damage.

If the risk is very high and the equipment is endangered, a unit extinguishing system must be provided. This applies in particular to digital telephone exchanges where a mass of electronics is found in a single cabinet.

### Equipment monitoring with point-type detectors

If a single cabinet has to be monitored, then a point-type detector can be installed in the cabinet itself. Frequently, however, this is impossible due to lack of space.

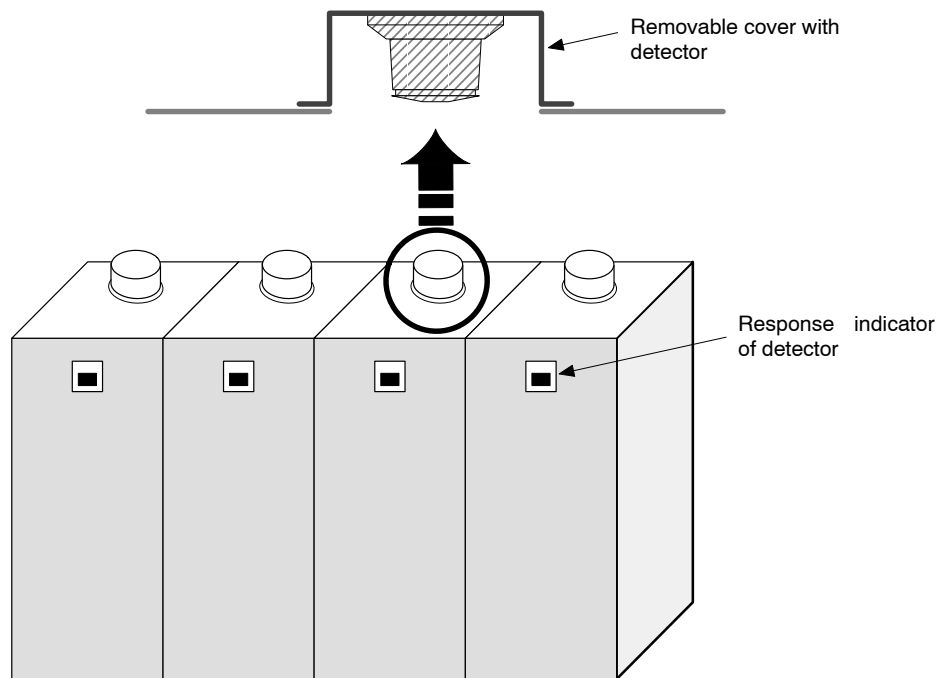
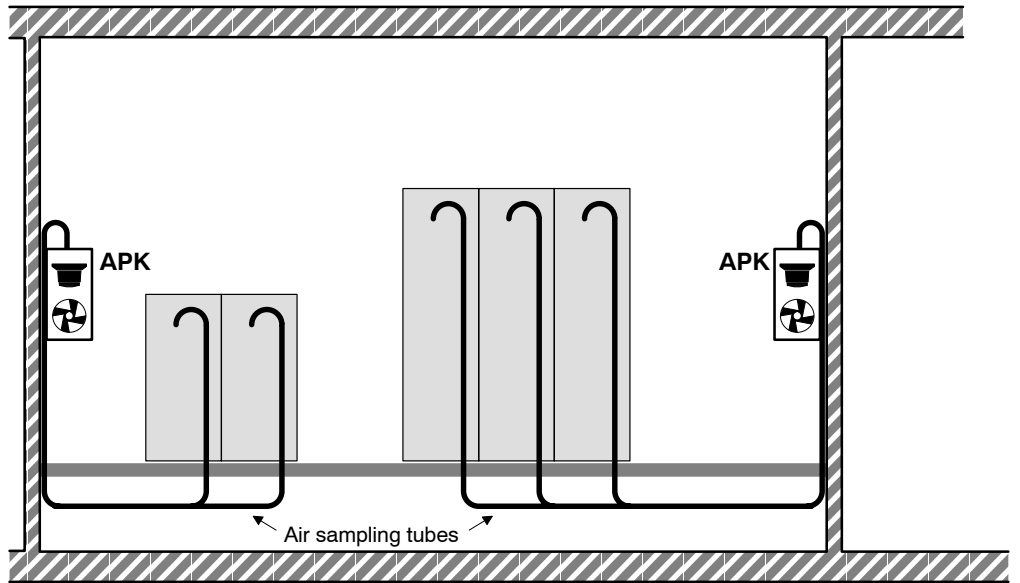


Fig. 7 Equipment monitoring with 1 point-type detector per cabinet

### Equipment monitoring with air sampling system

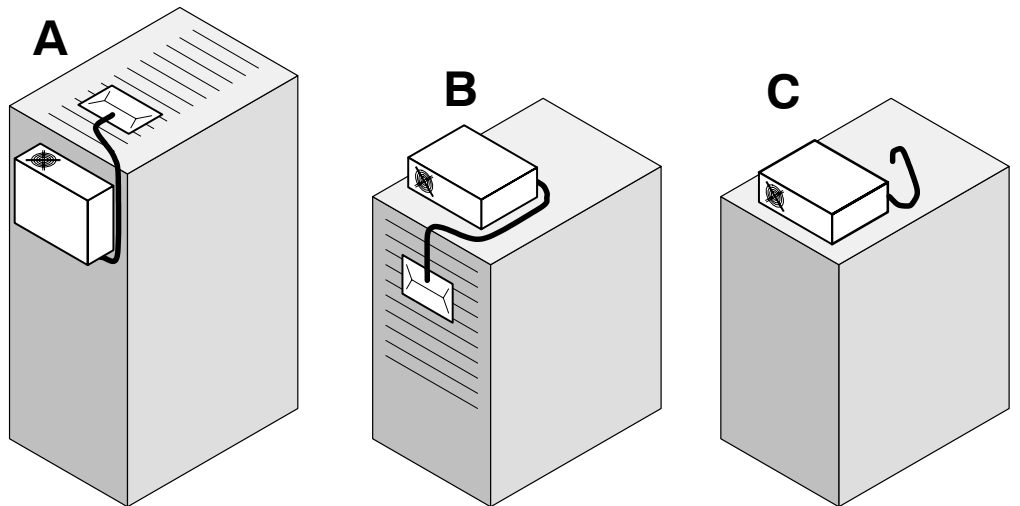
Air sampling systems mounted in or above the switchgear provide good, selective monitoring. Various systems can be employed depending on the design of the cabinets.

For detailed planning, see the guidelines for the individual systems.



APK = Air sampling chamber with smoke detector

Fig. 8 Equipment monitoring with air sampling system APK91; according to separate planning guidelines



- A Air outlet at top
- B Air outlet on side
- C Closed cabinet: air sampling tube with screwed conduit

Fig. 9 Equipment monitoring with combi fire detector BD4/6-C; according to separate planning guidelines

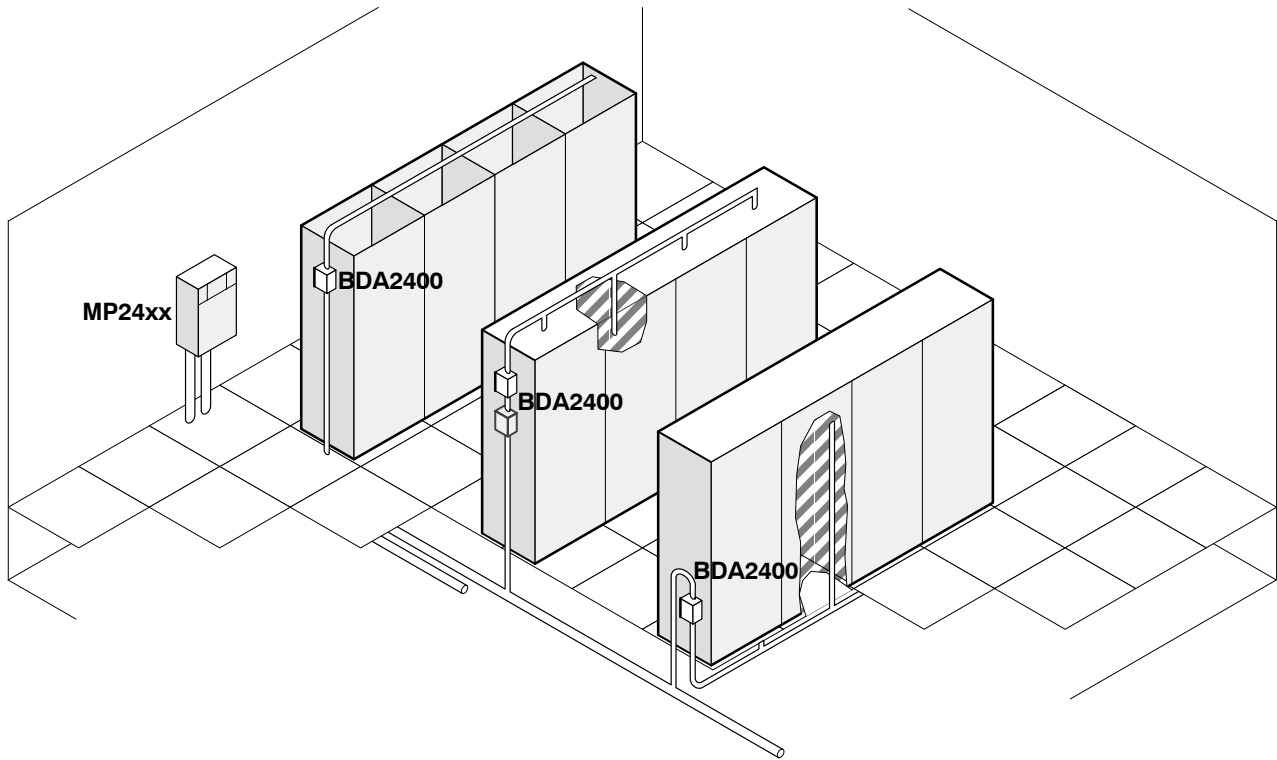
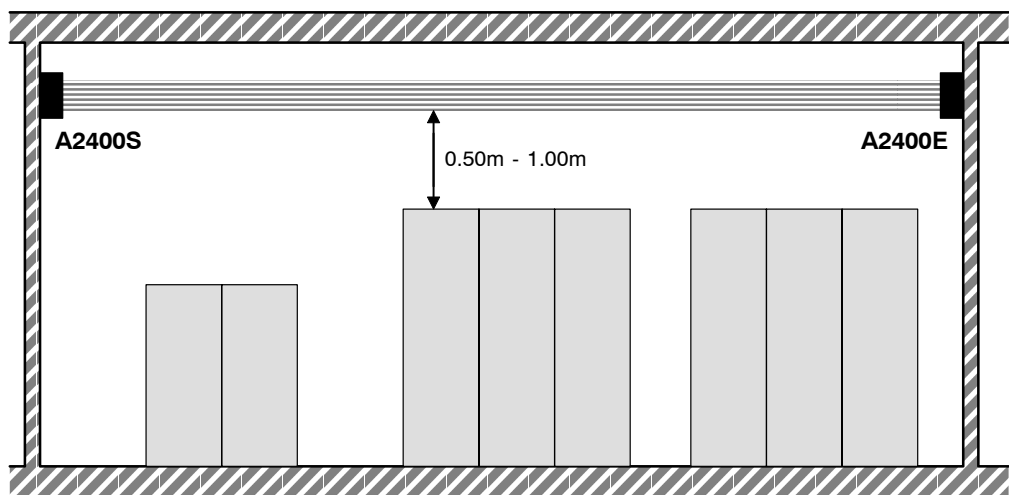


Fig. 10 Equipment monitoring with air sampling systems SMP2400; according to separate planning guidelines

Another alternative is the detection of smouldering fire by means of a linear smoke detector mounted above the equipment.



A2400S = Emitter of the linear smoke detector  
A2400E = Receiver of the linear smoke detector

Fig. 11 Equipment monitoring with a linear smoke detector A2400



## 2.6.6 Choice of detector sensitivity for adjustable detectors (MS9 / A24..)

	Floor voids		Room	Ceiling voids		Equipment monitoring		MS9 smoke entry settings
	ventilated	non-ventilated	ventilated	ventilated	non-ventilated	Point-type	Air sampling	
Ionization smoke detector	2 (N)	3 (+)	2 (N)	2 (N)	2 (N)	3 (+)	3 (+)	reduced
Scattered-light detector	3 (+)	3 (+)	3 (+)	3 (+)	3 (+)	3 (+)	3 (+)	large
Linear smoke detector			20% extinction					

Legend:

3 (+) = high response sensitivity

2 (N) = medium response sensitivity

## 2.7 Manual call points

Manual call points must be installed at all fire points and exits according to the general planning guidelines. They serve for general alarm.

## 2.8 Detector zones and detector lines

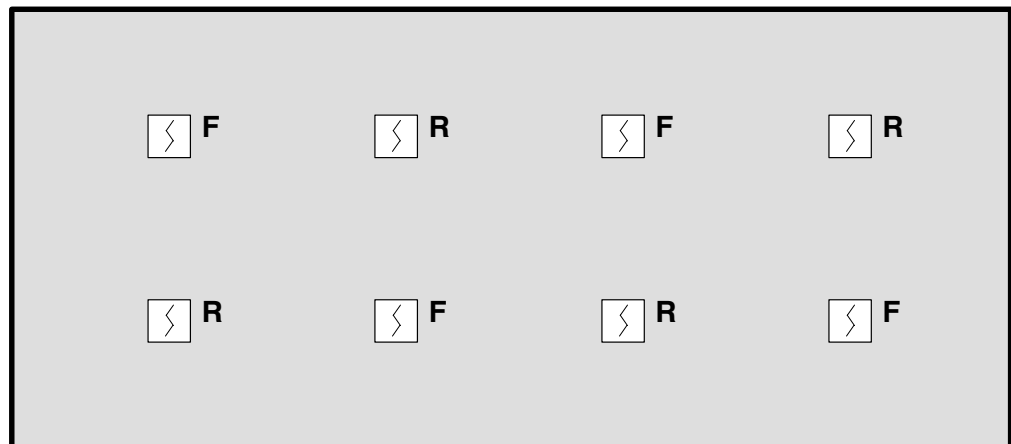
### 2.8.1 Formation of detection zones

Separate detector zones must be formed at least for the following areas:

- Floor voids
- Ceiling voids
- Switchgear room
- FPK air duct detector unit
- Cable ducts and cable cellars
- Manual call points at fire points
- Unit monitoring with extinguishing system

## 2.8.2 Mixed monitoring using F / R detectors

If a mixed monitoring concept is called for, both types of detectors must be used alternately.



F = Ionization smoke detector

R = Scattered-light smoke detector

Fig. 12 Alternate pattern for different types of detectors

## 2.9 Fire control installations

In telecommunication centers the following fire control installations must be checked:

- the switching off of the fresh air supply
- the switching off or over of the air conditioning system
- the activation of dampers
- the closing of fire doors
- the switching on of emergency lighting
- the opening of smoke vents
- the unbolting of doors (e.g. emergency exits)
- the activation of extinguishing systems

The necessary measures must be checked in each individual case with the telephone authorities concerned.

## 2.10 Avoiding false alarms

### Deceptive phenomena

- Smoking

The risk of false alarm from smoking is normally reduced by the exchange of air. However, during servicing, the air conditioning system may be shut down temporarily so that in rooms of <3m false alarms can occur. For this reason a strict ban on smoking must be imposed.

- Soldering

This is a similar situation to smoking. Vaporized flux as well as singed wire and cable have the same effect.

During extensive servicing work, the equipment monitoring systems concerned must be switched off.

- Draughts

The sensitivity of the F detector to draughts must be particularly considered in powerfully ventilated floor and ceiling voids. In such situations F detectors may not be set at maximum sensitivity.

## 2.11 Installation of fire detection systems

The installation of a fire detection system must be planned according to the guidelines in section 5, «CRP Fire protection systems».

In order to achieve electromagnetic compatibility, use cables with pairs of twisted wires.

Shielded cable must be used in areas where there is risk of powerful electromagnetic interference.

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