

# FAP 500 Series

FAP-O 500/FAP-O 500-P  
FAP-OC 500/FAP-OC 500-P  
Reference Guide



Security Systems



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# 1. Product description

With their flat design and flush-mounted installation, the fire detectors in the FAP 500 series open up a new dimension with respect to aesthetic and functional demands.

The cooperation of engineers and designers created the timeless, innovative design of this detector, which integrates pleasantly into the ceiling. The FAP 500 detectors with associated trim ring are available in «white» and «transparent with color inserts». The enclosed color inserts enable optimal adjustment to many different environments.

With the lack of optical labyrinth and their smooth surface, the FAP 500 detectors are also suitable for high-dust areas of application. Their flat, flush-mounted design allows use of FAP 500 detectors even in areas that must be free of protruding installations.

Thanks to the geometric arrangement of two separate optical sensor systems, the detectors are not sensitive to disturbance values such as insects. The scattered light volume that is evaluated by the sensors is in the free space. The degree of pollution is measured constantly. Pollution of the detector-surface causes a fault message in case of heavy pollution.

The FAP 500 is available exclusively as a scattered light smoke detector or as a multisensor detector with additional gas sensor:

- FAP-O 500 optical smoke detector, variants «white» and «transparent with color inserts»
- FAP-OC 500 combined optical and gas-sensitive smoke detector, variants «white» and «transparent with color inserts»

The combination of scattered light detector and gas sensor allows the evaluation of signals with the help of modern signal processing methods. The result is high immunity against false alarms and expanded application possibilities in environments that are not suitable for pure scattered light detectors.

The FAP 500 detectors can be connected directly to the Local SecurityNetwork LSN.

**Flush-mounted bases:**

For flush-mounted installation, detectors and bases are mounted in a robust ceiling mount back box. Detector bases are available in the following variants:

- FAA 500 LSN                      base
- FAA 500R LSN                  base with relay (deliverable in 2005)
- FAA 500GB LSN                base for Great Britain
- FAA 500GB-R LSN            base for Great Britain with relay (deliverable in 2005)

In all GB-versions there are bypass elements which ensure the functionality of the loop if the detector is removed. The bases with relay are required for special applications (e.g. door control). It can only be used together with LSN<sub>i</sub>-panels. Using the relay version no additional external detector alarm display (MPA) is allowed.

**Surface-mounted bases:**

For special applications where recessed ceiling mounting is not possible, bases are available as surface-mounting variants (deliverable in 2005):

- FAA 500S LSN                  base surface-mounted
- FAA 500SR LSN                base surface-mounted with relay
- FAA 500H LSN                base surface-mounted with damp room seal
- FAA 500HR LSN                base surface-mounted with damp room seal and relay

**Special versions for Great Britain:**

- FAA 500GB-S LSN            base surface-mounted for Great Britain
- FAA 500GB-SR LSN        base surface-mounted for Great Britain with relay
- FAA 500GB-H LSN        base surface-mounted for Great Britain  
with damp roomseal
- FAA 500GB-HR LSN        base surface-mounted for Great Britain  
with damp room seal and relay

The bases with damp room seal are for use of the detectors in damp environment. A seal on the bottom of the base protects against condensed water entry. All bases have an integrated strain relief for false ceiling cables. The connection terminals are easily accessible. Cables up to 2.5 mm<sup>2</sup> in diameter can be used.

An innovative concept for detector fastening allows very quick and easy use and exchange of the detectors. For detector testing and detector exchange, a special, user-friendly service accessory is available.

## 1.1. System description

All detectors in the FAP 500 series are equipped with two optical sensors and a pollution sensor. The multi-sensor detector FAP-OC 500 also has a gas sensor. The geometric design of the optical sensors and the signal evaluation guarantee that malfunction objects (e.g. insects) will not trigger alarms. Ambient light will be filtered out with a daylight filter as well as electronically by phase-synchronized rectifying.

The functioning of the CO sensor, the LEDs, and photo diodes in the optics as well as the evaluation electronics is monitored. In case of failure of the CO sensor or a component of the scattered light optics, a trouble message will be sent to the fire alarm panel. All sensor signals are analyzed continually by the internal signal analysis electronics and are linked with each other.

By linking the optical sensors and the gas sensors (combined detector), the detector can also be used in places where the work carried out gives rise to light smoke, steam or dust. Only if the signal combination matches the detector's programmed characteristic diagram will an alarm be triggered automatically.

## 1.2. Assembly of the detector

- 1 = optical sensor:
- T = transmitter (LED)
- R = receiver (photo diodes)
- 2 = CO sensor
- 3 = two-color LED  
(display of operation,  
alarm, malfunction  
and test mode)
- 4 = pollution sensor
- 5 = scattered light volume

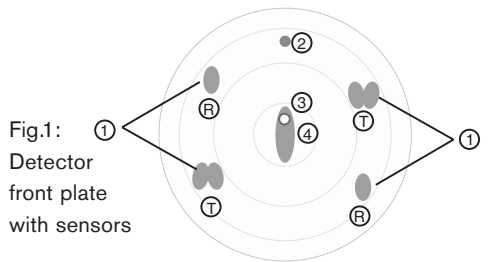


Fig.1:  
Detector  
front plate  
with sensors

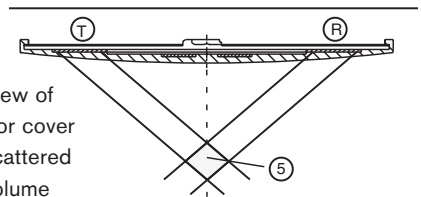


Fig.2:  
Side view of  
detector cover  
with scattered  
light volume

## 1.3. Functional description of sensor technology

### **Optical sensor (smoke sensor)**

The optical sensor works according to the light scattering principle. A light diode transmits light into the scattered light area at a defined angle. In case of fire, the light is scattered by the smoke particles and hits the photo diodes that transform the quantity of light into a proportional electrical signal.

### **Chemical sensor (CO gas sensor)**

The main function of the gas sensor (2) is to detect carbon monoxide (CO) generated as a result of a fire, but it will also detect hydrogen (H) and nitrous monoxide (NO). The basic measuring principle is CO oxidation on an electrode and the measurable current that arises from this. The sensor signal value is proportional to the concentration of gas. The gas sensor delivers additional information to effectively suppress false alarms.

### **Pollution sensor**

The degree of pollution on the detector surface is measured and evaluated continuously. A three-level pollution display occurs via the green operating LED and indicates the following detector state:

- Light pollution: Cleaning is necessary when the next service is due.
- Medium pollution: Detection security is still guaranteed, cleaning should occur as soon as possible.
- Heavy pollution: Malfunction display occurs since detection security is no longer guaranteed.

A differentiated display of the degree of pollution is possible during the sensitivity test in the test mode.

## 1.4. Features

- Easily-visible two-color LED indicates various operating states.
- Sensor system self monitoring with indication at the fire panel:
  - fault message in case of failure of the evaluation electronics,
  - fault message in case of failure of the LEDs of the optical sensors,
  - three-step indication of pollution level of the optical part (only for service),
  - fault message in case of heavy pollution,
  - fault message in case of failure of the CO-sensors (FAP-OC 500).
- Preservation of functionality of LSN-Network with broken wire or short-circuit at a detector by integrated splitting elements.
- Level of dirt built-up is continuously measured.
- Active adjustment of the threshold (drift compensation) of the optical sensor
- Active adjustment of the threshold (drift compensation) of the chemical sensor.
- Adaptable to the place of installation by programming.
- Report of a pre-alarm at the fire panel when 70% of the alarm threshold is exceeded.
- Via WinPara the following detector data can be extracted:
  - serial number
  - pollution level (optical part)
  - operating hours
  - current analog values.
- Activation of an external detector alarm display is possible.
- Very easily-accessible connection terminals.
- The EMC security fulfills the guidelines according to VdS 2110 (VdS Schadenverhütung GmbH) and the guidelines according to UL 268.
- Connectable to all BOSCH LSN fire panels (BZ 500 / UEZ 2000 / UGM 2020) as well as other panels with identical interface conditions.

## 2. Planning notes



**FAP 500 smoke detectors are not intended for outdoor use!**

**The detectors must be mounted so that they are not exposed to any direct sunlight!**

- The siting of the multi-sensor/chemical detector should follow the guideline for optical detectors until such time that a definitive multisensor standard is available.
- The siting of the FAP-OT 500 multi-sensor should be as per guidelines for optical detectors; see DIN VDE 0833 part 2 resp. VdS 2095:
  - maximum area coverage 120 m<sup>2</sup>
  - installation height max. 16 m
- Around the detector there must be a free space of approximately 50 cm radius. It must be guaranteed that neither persons, bigger animals, plants nor objects can intrude into this area. Therefore the minimal installation height is 3 m.
- A minimum distance of 50 cm from lamps must be maintained. The detectors may not be mounted in a cone of light from lamps.
- Maximum permissible air speed: 20 m/s.

### 3. Programming

Programming is the adjustment of the detector to the required operating mode. It is achieved using the software «WinPara» via a PC, connected to the central fire detection panel.

The detector FAP-OC 500 will be programmed by selecting the application or the area where the detector is installed (e.g. computer room, office, workshop, kitchen etc.). The installation area defines the optimal settings for the fire and false alarm evaluation of the detector.

The sensitivity of the purely optical detector FAP-O 500 can be set in three steps. Depending on the installation place the optical sensor is adapted to the environmental conditions.

For fire recognition, FAP 500 detectors use the temporal behavior of the smoke signal that deviates significantly from the temporal behavior of disturbance variables and also from the temporal behavior of a detector test with aerosol.

By programming the optical and gas sensor a high level of detection safety can be achieved. The algorithmic signal processing from each detection element further enhances the detectors ability to minimize the instances of false alarms.

**FAP-OC 500**

<b>Selectable installation places within the software «WinPara» for combined detector type (FAP-OC 500)</b>	<b>Sensitivity</b>	
	<b>O-part</b>	<b>C-part*</b>
Office (Smoker) / Waiting room / Restaurant / Boardroom	low	high
Conference room / Waiting room/ Exhibition hall	low	high
Warehouse with vehicle operation	low	high
Garage	low	high
Kitchen / Casino / Restaurant during public access	low	high
Production centers (plants)	low	high
Theatre / Concert hall	mid	high
School / Nursery	mid	high
Office (Public access)	mid	high
Computer room	high	high
Office (No public access)	high	high
High bord warehouse without combustion engine powered vehicle operation	high	high

\* The sensitivity of the C-part is always similar high, independent of the installation place.

**FAP-O 500**

<b>Selectable installation places within the software «WinPara» for optical detector (FAP-O 500)</b>	<b>Sensitivity O-part</b>
	Office (Smoker) / Waiting room / Restaurant / Boardroom
Conference room / Waiting room/ Exhibition hall	low
Warehouse with vehicle operation	low
Production centers (plants)	low
Theatre / Concert hall	mid
School / Nursery	mid
Office (Public access)	mid
Computer room	high
Office (No public access)	high
High bord warehouse without combustion engine powered vehicle operation	high



For fire recognition, FAP 500 detectors use the temporal behavior of the smoke signal that deviates significantly from the temporal behavior of a detector test with aerosol. For adaptation to test conditions with aerosol and shortening of the trigger time, the detector must be switched into test mode to perform a physical functional test.

Performing the detector test in normal operation, different trigger times (10 s to max. 60 s) will result from this, depending on sensitivity setting.

## 4. Technical data

### 4.1. FAP-OC 500 and FAP-O 500



Detector type	FAP-OC 500 / FAP-OC 500-P	FAP-O 500 / FAP-O 500-P
Detection principle	combination of scattered light and combustion gas measurement	scattered light measurement
Special features	<ul style="list-style-type: none"> <li>- pollution recognition</li> <li>- drift compensation in optical unit and in gas measuring unit</li> <li>- operation switching/sensor switching in the optical unit</li> </ul>	<ul style="list-style-type: none"> <li>- pollution recognition</li> <li>- drift compensation in optical unit</li> </ul>
Operating voltage	20 V to ... 30 V DC	
Current consumption	3.5mA	
Individual display	two-color LED: red (alarm), green (test mode)	
Alarm output	per data word via 2-wire signal line	
Indicator output	relay, switches 0 V over 1.5 k , max. 15 mA	
Response sensitivity		
- optical unit	< 0.36 dB/m (EN 54T7)	< 0.18 dB/m (EN 54T7)
- gas unit	in ppm range	–
Max. monitoring range	120 m <sup>2</sup> (observe local regulations)	
Maximum mounting height	16 m (observe local regulations)	
Minimum mounting height	3 m	
Max. thickness of the false ceiling (for flush-mounted installation)	32 mm	
Required bore hole	ø 130 mm (tolerance – 1 mm ... + 5 mm)	
Minimum distance from lamps	0.5 m	
Permissible air speed	20 m/s	
Permissible operating temperature	– 10°C ... + 50°C	– 20°C ... + 65°C
Permissible relative air humidity	< 95 % (non-condensing)	
Protection category according to EN 60 529	IP 33	IP 53
Interference stability	according to UL 268, VdS 2110, and DIN EN 50130-4	



Detector type	FAP-OC 500 / FAP-OC 500-P	FAP-O 500 / FAP-O 500-P
<b>Dimensions</b>		
- detector without trim ring	ø 113mm x 55 mm (without base) / ø 113 x 70 mm (with base)	
- detector with trim ring	ø 150mm x 55 mm (without base) / ø 150 x 70 mm (with base)	
<b>Housing material</b>		
Polycarbonate, flammability rating V-0 (according to UL 94)		
<b>Housing color</b>		
- trim ring	signal white, RAL 9003	
- detector cover	silver gray, RAL 7001	
	signal white or transparent (with color inserts)	
<b>Weight</b>		
- detector without packaging	165 g	
- detector with packaging	210 g	
- trim ring	30 g	
<b>Order number detectors</b>		
FAP 500 <b>white</b>	4.998.143.522/ -	4.998.150.695 / -
FAP 500 <b>-P transparent</b> (with color inserts)	- / 4.998.150.696	- / 4.998.150.697
<b>Order number trim ring</b>		
White	4.998.151.295	
Transparent (with color inserts)	4.998.151.296	

## 4.2. FAA 500 BB Ceiling mount back box



Ceiling mount back box	FAA 500 BB
<b>Housing</b>	
- Material	Polypropylene, flammability rating V-0 (according to UL 94)
- Color	natural colors
<b>Dimensions</b>	
ø 140 mm x 104 mm	
<b>Weight</b>	
100 g	
<b>Order number</b>	
4.998.151.302	

### 4.3. FAA 500 / FAA 500R Detector bases (flush-mounted)



Base type	FAA 500	FAA 500R (with relay)
Connections	Terminals for: power supply (0 V, + V) LSN (a-in/out, b-in, b-out) C-point shielding	Terminals for: power supply (0 V, + V) LSN (a-in/out, b-in, b-out) C-point shielding relay (NO, NC, COM)
Current consumption EOL relay	–	0.2 mA
Contact load	–	1 A, 30 V DC
Cable diameter	0.3 mm <sup>2</sup> - 3 mm <sup>2</sup> (22 AWG - 12 AWG)	
Housing		
- Material	Polycarbonate, flammability rating V-0 (according to UL 94)	
- Color	signal white, RAL 9003	
Dimensions	ø 145.6 mm x 63.5 mm	
Weight	200 g	
Order number	4.998.151.297	4.998.151.299

### 4.4. FAA 500GB(-R) Detector bases for Great Britain (flush-mounted)

Base type	FAA 500GB	FAA 500GB-R (with relay)
Special feature	bypass elements for functionality of the loop after detector removal	
Connections	Terminals for: power supply (0 V, + V) LSN (a-in/out, b-in, b-out) C-point shielding	Terminals for: power supply (0 V, + V) LSN (a-in/out, b-in, b-out) C-point shielding relay (NO, NC, COM)
Current consumption EOL relay	–	0.2 mA
Contact load	–	1 A, 30 V DC
Cable diameter	0.3 mm <sup>2</sup> - 3 mm <sup>2</sup> (22 AWG - 12 AWG)	
Housing		
- Material	Polycarbonate, flammability rating V-0 (according to UL 94)	
- Color	signal white, RAL 9003	
Dimensions	ø 145.6 mm x 63.5 mm	
Weight	200 g	
Order number	4.998.151.978	4.998.151.979

## 4.5. Detector bases for surface-mounting

The series of detector bases for surface-mounting will be available in 2005.

## 5. Accessories

The FAP 500 detector is generally mounted flush with the ceiling in false ceilings. For this, a special ceiling mount back box and a base are required.

For concrete ceilings, there is a special built-in housing available. Alternatively, the detector can also be used with a surface-mounted base (without ceiling mount back box).

The base with relay is required for special applications (e.g. door control). It can only be used together with LSNi-panels. Using the relay version no additional external detector alarm display (MPA) is allowed.

## 5.1. Ceiling mount back box

The ceiling mount back box FAA 500 BB is made of natural-colored polypropylene.

It has four grommets with tightly-closing rubber lips of polyflam that are suitable for cable diameters up to 1.4 cm.

When used with a base, approximately 30 cm of cable length can be accommodated in the upper area of the ceiling mount back box.

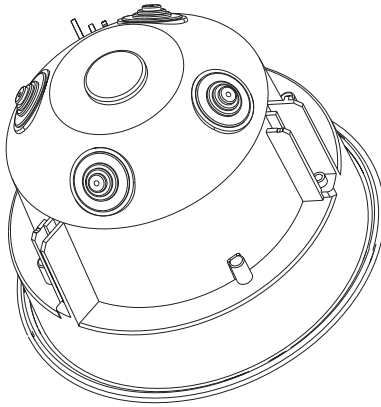


Fig. 3:  
Ceiling mount  
back box



**Follow national guidelines for mounting locations!**

**The false ceiling may have a maximal thickness of 32 mm. Above the false ceiling, a free height of at least 11 cm is required.**

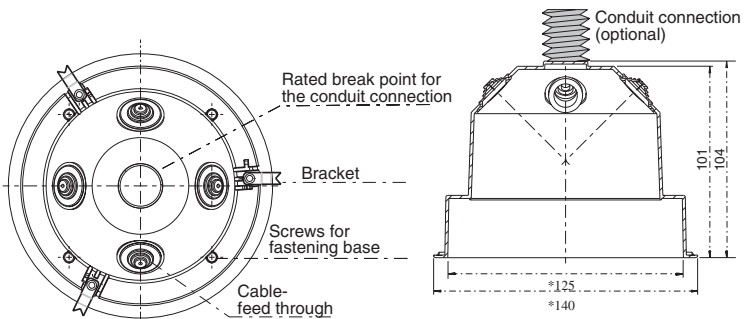


Fig. 4.: View  
and side view  
of the ceiling  
mount back box

All measurements in mm

## 5.2. Detector base / detector base with relay

The base housings are made of white polycarbonate.

The 7 or 10 terminals (base without or with relay) guarantee a secure electrical connection via the connected contacts when mounting the FAP 500 detectors.

The screw clamps are designed for cable diameters of 0.3 mm<sup>2</sup> to 3 mm<sup>2</sup>.  
The bases have 3 holders for cable ties for fixing the cable.

Connection	Clamp
LSN b in	b1
LSN b out	b2
LSN a in/out	a1/a2
Indicator output	c
Shielding	
Voltage +	+ V
Voltage -	0 V
Relay outputs	NO
(base with	NC
relay only)	COM

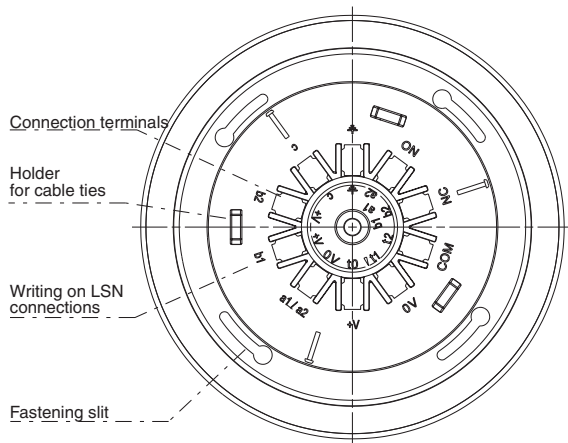


Fig. 5.: View of base

### 5.3. Bases for Great Britain

For application in Great Britain the base has integrated bypass elements. If the detector is removed they ensure the functionality of the loop by interconnection.

### 5.4. Surface-mounted bases

For special applications where recessed ceiling mounting is not possible, a series of surface-mounted bases will be available (in 2005):

- FAA 500S                LSN base surface-mounted
- FAA 500SR            LSN base surface-mounted with relay
- FAA 500H             LSN base surface-mounted with damp room seal
- FAA 500HR           LSN base surface-mounted with damp room seal and relay

Special versions for Great Britain:

- FAA 500GB-S        LSN base surface-mounted for Great Britain
- FAA 500GB-SR      LSN base surface-mounted for Great Britain with relay
- FAA 500GB-H       LSN base surface-mounted for Great Britain with damp room seal
- FAA 500GB-HR     LSN base surface-mounted for Great Britain with damp room seal and relay

For use of the detectors in damp environment, a seal is placed on the bottom of the base to protect against condensed water entry.

### 5.5. Build-in housing for concrete ceilings

In development.

## 6. External detector alarm display (MPA)

The external detector alarm display MPA is required if the detector is not directly visible or has been mounted in false ceilings / or floors. The MPA should be mounted in corridors or access pathways to the corresponding building sections or rooms.

The red alarm display (A) corresponds to DIN 14 623.

The external detector alarm display MPA

Using a relay base version (FAA 500R / GB-R / SR / HR / GB-SR / GB-HR) no additional External Detector Alarm Display is allowed.

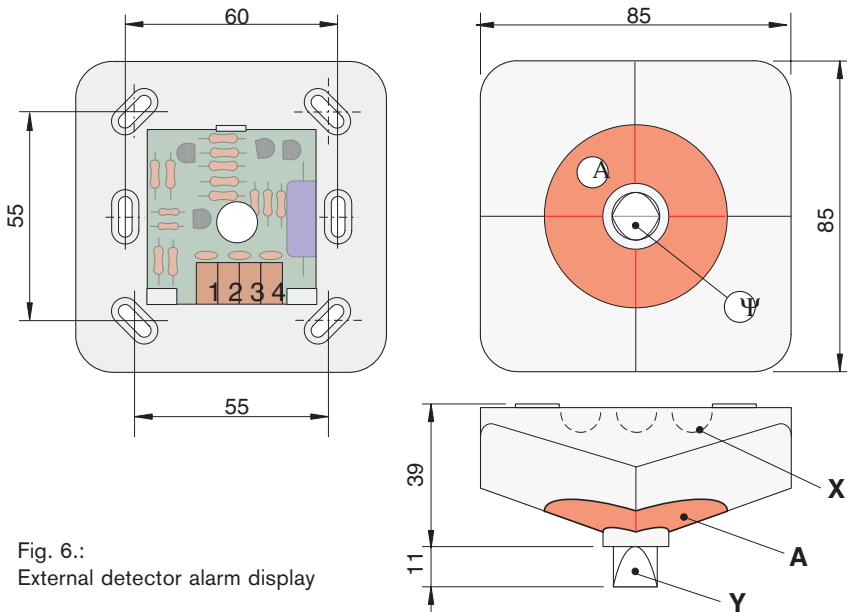


Fig. 6.:  
External detector alarm display

## 7. Order overview

### 7.1. Detector variants

Order number	Designation
6649 981 50695	<b>FAP-O 500</b> , white Optical smoke detector
6649 981 43522	<b>FAP-OC 500</b> , white Multi-sensor detector optical / chemical
6649 981 50697	<b>FAP-O 500-P</b> , transparent with color inserts Optical smoke detector
6649 981 50696	<b>FAP-OC 500-P</b> , transparent with color inserts Multi-sensor detector optical / chemical
6649 981 51295	<b>FAP 500TR W</b> Trim ring white, for FAP 500 detectors
6649 981 51296	<b>FAP 500TR T</b> Trim ring transparent with color inserts, for FAP 500 detectors

#### Color inserts for FAP-O 500-P and FAP-OC 500-P

Color	RAL
beige	1001
sulphur yellow	1016
red orange	2001
fluorescent orange	2007
Erica violet	4003
signal blue	5005
sky blue	5015
turquoise green	6016
yellow green	6018
light green	6027
signal gray	7004
basalt gray	7012
earth brown	8003
nut brown	8011
signal white	9003
graphite black	9011



Fig. 7.: Color samples for color inserts

## 7.2. Detector bases and accessories

Order number	DU*	Designation
6649 981 51297	PC	<b>FAA 500 LSN</b> base
6649 981 51299	PC	<b>FAA 500R LSN</b> base with relay
6649 981 51297	PC	<b>FAA 500GB LSN</b> base for Great Britain
6649 981 51299	PC	<b>FAA 500GB-R LSN</b> base for Great Britain with relay
**	PC	<b>FAA 500S LSN</b> base surface-mounted
**	PC	<b>FAA 500SR LSN</b> base surface-mounted with relay
**	PC	<b>FAA 500H LSN</b> base surface-mounted with damp room seal
**	PC	<b>FAA 500HR LSN</b> base surface-mounted with damp room seal and relay
**	PC	<b>FAA 500GB-S LSN</b> base surface-mounted for Great Britain
**	PC	<b>FAA 500GB-SR LSN</b> base surface-mounted with relay for Great Britain
**	PC	<b>FAA 500GB-H LSN</b> base surface-mounted with damp room seal for Great Britain
**	PC	<b>FAA 500GB-HR LSN</b> base surface-mounted with damp room seal and relay for Great Britain
6649 981 51302	PC	<b>FAA 500BB</b> Ceiling mount back box
n.n.	PC	<b>FAA 500CC</b> Built-in housing for concrete ceilings

\*DU = Delivery unit; PC = Pieces

\*\*available in 2005

### 7.3. Service accessories / Extensions

Order number	DU*	Designation
n.n.	PC	FAA 500RTL Removal tool for FAP 500 detectors
n.n.	PC	FAA 500TTL Test tool for FAP 500 detectors, with integrated magnets
6649 981 09056	PAK	CO testing gas (400ml spray can) for detectors with CO sensors, can be used in the test tool for FAP 500 detectors
6649 981 12069	PC	Telescope pole (1m - 3.38 m) of fiberglass, can be extended with max. 3 extension rods
6649 981 12070	PC	Extension pole of fiberglass (1m)
6649 981 12073	PC	Transport bag for test devices and accessories
6627 993 30669	PC	MPA External detector alarm display, according to DIN 14 623

\* DU = Delivery unit; PC = Pieces, 1 PAK = 10 pieces

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